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JOURNAL

OF THE

FRANKLIN INSTITUTE

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OF THE

State of Pennsylvania;

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

EDITED

BY THOMAS P. JONES, M. D.

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JULY, 1834.

Remarks on the method of laying the iron plates on Wooden Rail-roads. *By* Alfred C. Jones.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Having read in the September number of this Journal, the valuable remarks of the Editor on rail-roads, and thinking that any hints which may tend to render them safer for travelling on will be acceptable, I proceed to give some observations in addition to those which have been the subject of the Editor's notice.

The plates, or bars, on the Little Schuylkill Rail-road are of two kinds, about four-fifths of the number are two inches wide, and scant half an inch thick; the remainder are two inches in width by scant five-eighths in thickness in the middle, the top side being slightly rounding. The angles of the ends of those first mentioned are about forty-five degrees, and the angle of the others twenty degrees.

There are two locomotive engines plying on the road, and in the course of last season, they ran off the track fourteen times; the cause of running off was each time traced to the acute angles of the ends of the first described bars, which projected out enough to strike the flanch and cause the wheel to rise above the rail, and, of course, the engine to leave the track. I do not recollect a single instance in which the engine or cars have run off where the angles of the ends of the bars are twenty degrees.

It is urged in favour of using the angle of forty-five degrees that

the bearing will be more perfect at the joints, and that the ends of the bars will not sink so much into the wood.* By a personal examination of several miles of the road, I found that there was little difference in the depression of the ends of the bars in the wood, where the different angles before described were used; in those of forty-five degrees the inner point was sunk more than the middle of the end of the bar; some which I measured were as much as a quarter of an inch lower.

It is well known that the bars become loose from vibration, and other causes, and in running round a curve in the direction of the arrow in the figure; the centrifugal force acting against the bar A, forces it from its place, which leaves the point of the bar B projecting; this defect is often increased by the bars being previously out of line.

There is a great error in laying the bars with the ends butting, close together, nothing being allowed for the expansion of the metal; there are a number thus laid on the Little Schuylkill and Columbia Rail-roads, and at the present time the point of a penknife cannot be inserted at their joints.

As the stiff castings for turn-outs are going out of use, I will say but little about them, it being admitted by all who have had any experience on rail-roads, that they are the most unsafe thing in connection with the road. The best kind of turn-outs now in operation are those in which the switches, or rails are movable, they being connected together with one or more rods, so that they will open or shut together; the length of the switches on roads where steam is the motive power, should in no case be less than six feet, and the turn-outs in proportion.

It appears to me to be an improper method of laying the bars so that the cross section shall be horizontal, where engines and cars with conical wheels are used, the bearing being on the inner edge until the bar settles in the rail. By the examination of a cross section of several old rails, they having been cut where the bearing was on the sleeper, I found that the cohesion of the wood was destroyed on an average five-sixteenths of an inch from the inner side. I would suggest that the bars should be laid at a greater bevel than the cone of the wheel calls for; the inner side of the rail in this method would not be acted on until the bar had a perfect bearing.

I have confined my remarks principally to wooden roads, as I consider that they are the only kind proper for locomotive engines, the wear and tear of the machinery being less on them.

Respectfully yours,
A. C. Jones.

P. S. There was a slight mistake in the latter part of my commu-

* On the Columbia, and Philadelphia, and Trenton rail-roads, there are plates of iron secured flush with the top of the rail to prevent the ends of the bars from sinking in the wood. Some engineers have used plates of zinc for the same purpose, which are as suitable as brown paper.

nication on using anthracite coal in smiths' work;* it should read thus: The tuyere iron may be protected from the intense heat of the fire, by occasionally throwing a little of the refuse coal against the fire back, which coal melts down and coats the iron.

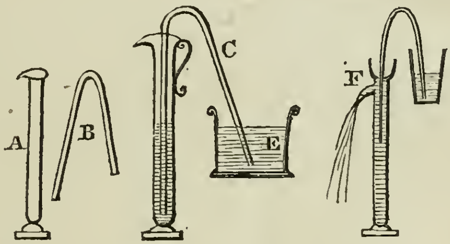
Philadelphia, April 15, 1834. A. C. J.

Description of a new mode of using the Syphon. By Thomas Ewbank, *of New York city.*

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Having lately had occasion to use a syphon, I tried one in the form represented page 336, vol. ix. Journal of the Franklin Institute—but it is only applicable in those cases where the short leg can be plunged into the liquid up to the bend. If, at *any time*, the liquid to be withdrawn is not equal in depth to the length of this leg, this syphon will not act: hence its application is very limited. The second one, described in the next page (337) is not subject to this objection, but when used for different acids, &c. the contents of the pipes *d* and *c* would require to be discharged. (Ought not the short leg in the cut to have been represented as the longest?†)

The following plan suggested itself, which I find to answer very well.



A, is a tube closed at its lower end, and equal in length to the longest leg of the syphon B, which is placed in it, as at C; and it is then to be filled with water or other fluid, and the other leg of the syphon placed in the liquid to be withdrawn. A, is then moved down, which causes the liquid to rise into the short leg and fill the syphon. Its descent should rather exceed the distance between the surface of the liquid to be transferred and the bend of the syphon. A, may then be either wholly removed or not, for when the syphon is filled, the discharge of the liquid may be made by a spout or tube attached to A,

* See this Journal, vol. xiii. p. 73.

† Our correspondent is correct in this remark on the cut referred to.

Com. Pub.

as at F; and to stop it nothing more is required than to slide the tube up till the spout is above the surface of the liquid in E.

Might not this plan be advantageously adopted in withdrawing poisons from the stomach in cases where a pump or other means are not at hand? I ought to have mentioned, that the capacity of that part of the leg inserted into A, should exceed that of the remaining part of the syphon; on this account it should be rather larger in diameter.

Liquids may be raised to a higher level by this method. At page 226, vol. xii. of this journal, is described an ingenious apparatus by Prof. Hare, for transferring acids, &c. which will serve for illustrating this remark.

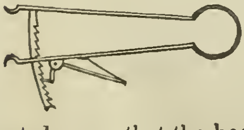
Supposing the capacity of the tube which connects the syringe to the bottle, was equal to that of the latter, and it were inclosed in another similar to A in the above figure. By filling it with the liquid, and then allowing it to descend (as low as the acid has to rise) the bottle would be filled. This apparatus would in such cases act as a substitute for a pump, and be free from friction. In those cases where a small quantity of liquid is required at a time, and it is inconvenient to allow a descent equal to the rise of the fluid, a vessel of mercury or other heavy fluid might be advantageously substituted.

Very respectfully,
THOMAS EWBANK.

Description of an instrument to be used with the Stomach Pump.

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—The description of Dr. Goddard's stomach pump, contained in the number of your Journal for April last, brought to my recollection an instrument invented by me several years since; which I believe to be a necessary appendix to the stomach pump. It may be called a gag; the form of which is explained by the accompanying figure; it should be made of steel, say three-fourths of an inch wide, the circular end having a spring temper; the arc is serrated on the inner edge, and works through a slot in the lower leg. When to be used, place the finger on the lever of the click, press the two legs together, and insert the end in the mouth of the person to be operated on, so that the hooked ends may set on the front teeth. If the person then open his mouth, the spring will keep the ends of the gag in contact with the teeth, the click preventing him from shutting it again until the gag is removed. I have several times witnessed the operation of extracting poison from the stomach; the instrument employed for keeping the mouth open, was the handle of an iron spoon or a door key, which did considerable damage to the teeth, and in one case the flexible pipe connected with the pump, was nearly bitten in twain, the spoon having slipped from between the teeth.



Respectfully, yours,
Philadelphia, May 14, 1834. A. C. JONES.

FRANKLIN INSTITUTE.

Monthly Conversation Meetings.

The monthly meeting of the Institute for conversation, was held at the Hall of the Institute April 24, 1834.

Mr. John C. Warren of the city of New York, exhibited a machine for hoisting heavy bodies, invented and patented by Mr. John Drummond. This machine was much admired for its compactness and efficiency and for the ease with which the intensity of the applied power could be varied.

Mr. Tyler, of the firm of Tyler, Fletcher, & Co., of this city, exhibited and explained the use and operation of a vibrating roller press, made by the above mentioned firm, for transferring engravings from original plates, or dies, to those intended to be used for printing, as in bank note plates, &c. A description of this machine is expected to appear in a future number of the journal.

Mr. Isaiah Jennings, of New York, exhibited several of his lamps for burning spirit gas.

A new door plate by Mr. Paul Moody was examined, and its merits discussed; this door plate has the name inserted beneath a plate of glass, which is set in a brass frame, resembling, in form, the ordinary door plate.

And at the monthly conversation meeting held May 22, 1834—

Professor Johnson made experiments on the centrifugal force of liquids, in refutation of certain statements made by M. Thayer, in a paper read to the French Institute, an outline of which has been given in the Revue Encyclopedie for September, 1833. The liquids used were oil, water, alcohol, and mercury, and the experiments embraced the cases of rotation about the axis of a vessel in which the oil and water were placed, as well as the vibrations of the vessel containing alcohol, water, and mercury. A detailed account of the experiments may be expected in the next number of the Journal.

Jacob Green, M.D. exhibited an electro-magnetic apparatus by Prof. Henry, for the production of a reciprocating motion, by the combined action of electro-magnetic currents and of permanent magnets. He also referred to a modification of the same, in which electro magnets being substituted for the permanent magnets used in this apparatus, the whole effect would result from the magnetism developed by galvanic action.

Mr. Samuel B. Sexton, of Philadelphia, exhibited a model of an apparatus invented by him, for warming houses by heated air, and so constructed that at the same time the various modes of cooking can be performed by it, without interfering with its other purposes; it can be applied to either, or both purposes, at the option of the proprietor.

Prof. A. D. Bache brought forward articles of apparatus for the polarization of light, recently imported for the Friends' College at Haverford The polarizing effect of the tourmaline was seen by a simple

arrangement of two plates of that mineral, cut parallel to the axis, and fitted into wire rings so as to admit of rotation while the plains remain parallel to each other. A complete instrument for the polarization of light by reflexion formed the second article.

Specimens of tinned lead pipe, from Mr. Ewbank, of New York, were placed upon the table; but the lateness of the hour at which the other subjects were concluded, prevented an examination of them.

Report of the Managers af the Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts, in relation to Weights and Measures. Presented in compliance with a Resolution of the House of Representatives.

TO THE HON. JAMES FINDLAY,

Secretary of the Commonwealth of Pennsylvania.

The Managers of the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic arts, respectfully present to the Secretary of the Commonwealth their report in relation to the subject referred to them by the direction of the House of Representatives. At the stated meeting of the Managers, next subsequent to the receipt of the communication of the Secretary of the Commonwealth,* dated May 29th, 1833, a committee† was appointed to consider the subject, and to report to the Managers of the Institute. Their report, which has been unanimously adopted, is now respectfully submitted. It is believed that no more time has been consumed by the committee than was required by a careful investigation of the subject intrusted to them, and the Managers hope that the delay of this report beyond the time of meeting of the Legislature, will be attributed to the necessity of the case.

ALEX. FERGUSON, Chr'm.

Wm. Hamilton, Actuary.

REPORT IN RELATION TO WEIGHTS AND MEASURES IN THE COMMONWEALTH OF PENNSYLVANIA.

Adopted by the Managers of the Franklin Institute, January 25, 1834.

The Committee of the Franklin Institute, appointed by the Board of Managers to consider the subject of Weights and Mea-

* See Appendix No. I. vol. xii. p. 304.
†See Appendix No. III. vol. xii. p. 309.

sures, referred to them by direction of the House of Representatives of the Commonwealth, respectfully report:

That since the date of their appointment, in June last, they have given to the subject the attention which its importance so well deserved. In order to have before them, in a condensed form, the facts relating to the practical bearing as well as to the theory of the matters of inquiry, the Committee requested from three of its members* reports upon the systems of weights and measures, of England, and of France, and upon the state of the question in our own country. The reports† contained in the Appendix, herewith presented, resulted from this request. In the first of these is given a description of the French metrical system, and of the scientific operations required in its establishment; in the second, a brief history of the weights and measures of England, with the method of connecting the recent and reformed system with a scientific basis; and in the third, an abstract of the reports upon weights and measures made to the Congress of the United States, and to the state Legislatures of Pennsylvania and New York. An examination of these reports will show from how many points our subject has been viewed, and in what varied lights, and how little novelty can be expected in any view which at this time may be submitted. This circumstance will perhaps be found of important practical benefit, for a desire to present what is novel, may have led to much of the inapplicable speculative inquiry with which the subject is encumbered.

The Committee think that they may assume that the House of Representatives, of the Commonwealth, in referring, the bill relating "to weights and measures and to admeasurement" to the Managers of the Franklin Institute, did not intend to confine their report exclusively to the consideration of that bill, but rather that it should form the basis of their investigations.

With this view of their duties, the Committee would propose to consider the subject under two suppositions; the first, that the Legislature of Pennsylvania shall determine, or have determined, to legislate in relation to a system of weights and measures for this commonwealth, independently of other states; secondly, that a combined action by the several states, or by the Congress of the United States, may be admissible.

In legislating upon any matter which in its varied ramifications affects almost every business in which men engage, there cannot be too much caution. Usages have grown up in all trades which have become a part of those trades, which require a portion of an apprenticeship to learn, in contravening or changing which by law, the interests of the citizen, if not his rights, are

* See Appendix No. III. vol. xiii. p. 94.
† See Appendix Nos. IV, V, & VI. vol. xiii. p. 94, 160, 232.

infringed. Hence the necessity of entering thoroughly into details which can only be supplied by the members of each art, or trade, from their own knowledge of their own wants, and which should properly vary with the progress of that art; or of leaving such details to adjust themselves, upon the basis of careful legislation upon general principles.

A system of weights and measures which aims at furnishing such general principles, should establish the standard of linear measure, and fix the relation of the standard of capacity measures to that of the linear measure; should provide for procuring, preserving, and distributing positive standards of measure and of weights, and should refer the entire system to natural invariable standards, by which its permanence might be secured. It should be accompanied by a supplementary law less fixed in its character, which should state the principal denominations of the several measures and of the weights, and their relation to each other and to the standards.

The system may contemplate an entire change in the standards and in the denominations; or it may aim at providing standards in conformity with those in most common use, and by which the accuracy of existing standards may be at all times tested, and at improving existing denominations.

The case of an entire change is presented by the French metrical system, where throwing aside, in their measures the denominations of foot and toise, they adopted a new denomination, the metre, corresponding to a new length, the ten millionth part of a quadrant of a terrestrial meridian. The present English system is in part of the second kind; leaving to usage to establish the denominations, it aims at providing positive standards of authority, and of perpetuating them by their comparison with invariable standards furnished by nature. The inability of the first system, to contend against usage, is to be found in the establishment by law in France of a metrical foot, one-third of a metre in length, of a metrical pound half the kilogramme of the new system in weight. Had one currency been in use throughout our infant country, when the present currency was established, it is not impossible that its beautiful simplicity might, even at this day, have existed only in theory.

Sound policy, nevertheless, requires that, from time to time, such changes should be introduced in existing denominations as will tend to simplify the system, and to bring it gradually nearer to perfection, but even in these, perhaps, the law should follow indications of change dictated by convenience, rather than undertake to lead them.

A system of weights and measures and of denominations based upon that in common use in our country, would include the fol-

lowing particulars: first; a reference to some existing measure, as the standard of length; as, for example, to a certain yard measure in the possession of the state, which should be declared at a certain temperature to be the linear unit. The multiple and submultiple denominations of this standard, should be declared as lines or nails, inches, feet, perches, &c. Second; a unit measure of capacity, as for instance the bushel, should be defined in reference to the linear standard. This unit might be taken for both dry and liquid measures, or it might be deemed adviseable to conform to usage by providing different units for liquid and for dry measure. In regard to the denominations an obvious improvement might be made by avoiding the use of the same name for things essentially different, as a gallon for different capacities according to its use in dry or in liquid measure, a change which would not fail to be sanctioned by general adoption. Third; a reference to a positive standard for weight, as a certain pound in the possession of the State. The multiple and submultiple denominations to be regulated. And here a question presents itself, whether it may be possible to have but one unit of weight denominated the pound, rejecting the troy or avoirdupois pound, as may be thought adviseable. In choosing between them the difficulty presents itself that the former pound has been legalized by Congress in our coinage, by referring to the standard troy pound in possession of the mint, while the latter is the pound generally used in commerce. It is probable that this innovation could not be made with advantage at present. In regard to the denominations a similar difficulty is presented in the ton, which is either 2,240 or 2,000 lbs. according to locality, or to usage, or to agreement. To the adoption of the ton of 2,000 lbs. technically called the short ton, there does not seem to be any insuperable objections. It is so convenient in practice that it has been legalized by several of the states, and is used in many cases, in our own commonwealth.

In providing for the distribution of positive standards throughout the state, the nature of the material of which they shall be made, will be an important item. For the material of their positive standards of length, the French adopted iron, the English brass; for those of weight, the former employed platinum for the original standard, and brass for the copies, the latter brass for both. In case of the adoption of either metal, it would be important to inquire by experiment more carefully than has been hitherto done, into their relative expansions under different circumstances of manufacture. This would not bear merely upon the theoretical perfection of the standards, but upon that in practice, for two standards which were alike when made in winter, might if compared in summer differ so much, that one would be

thought to require the expense of alteration. If the yard stick of the merchant will not be changed by this difference, it will become sensible in the chain of the surveyor, and the land holder will find his limits affected by it.

Next, the positive standards thus provided, should be referred to some natural, invariable standard. The necessity for this reference is so frequently denied that the object would seem not always to be perceived. Positive standards are liable to change by accident and by use. Let us suppose a case in which a standard of measure belonging to the Commonwealth and carefully deposited in one of its offices, receives injury in taking it down for examination or in the course of a comparison of another measure with it. The county standards are resorted to, for the purpose of recovering the original length of the standard, but if not well preserved, or if frequently used, they disagree. It is in such a case, and the probabilities are strong of the occurrence at some time of similar cases, that the natural, invariable standard becomes the means of deciding between the varying measures. The length of a pendulum vibrating seconds, or the arc of a meridian is measured by using either of the measures; the length thus found is the same number of inches and parts of an inch with that of the pendulum, or of the arc, which was previously fixed, with reference to the original standard, or is so many parts of an inch too long, or too short, and the length of the original measure is known by reference to that which has been tested. But it is not necessary to resort to any supposition of accident which may occur to the positive standard; the experience of England has shown that under ordinary care, changes will be found from century to century, and that measures which are at one time easily known and recognized to be the standards, may at some other time be the subjects of antiquarian research. Part of the reproach under which the scientific operations here referred to, lie, namely, that they are liable to corrections as science progresses, is due to the fact that experimenters have not been satisfied with stating the results of experiment, but have endeavoured to deduce from theory the relation between those results and others in other circumstances, using for this purpose the data furnished by the science of the day. Thus they have not been satisfied with stating that the pendulum vibrating seconds, and in a circular arc, measured with a means described, at a given temperature and pressure, and at a particular spot, was a certain number of inches of the standard; but they have undertaken from their experiment to conclude what the length would be in a vacuum, in a small arc, at an assumed temperature and pressure, at the level of the sea, and in a particular latitude, and these before the weight of the air, the effect of its buoy-

ancy &c. were well known and established, even according to the knowledge of the day.

The Committee, in the discharge of the duty committed to them by the Managers, proceed to submit their examination of the bill referred by the House of Representatives; in this they will be as brief as is permitted by the fact that many of the provisions of it are at this time the law of the state. If the Committee are correct in the ideas which they have already expressed in relation to the requisite enactments for regulating weights and measures, the objection to the bill, on the score of its leaving general principles to enter partially into details, is a sound one; this remark has reference more particularly to that part of the bill which relates to admeasurement, in relation to which it will be necessary for the Committee to go into minutiæ, in order to be intelligible.

The twenty-seventh and twenty-eighth sections establish a certain ratio between the weight of different commodities, and the measured bushel, in regard to which, as far as the usage of this portion of our State can be ascertained, four of the commodities mentioned are not bought and sold by weight; and of the two which are, one is always purchased at a different weight per bushel from that assigned in the sections, the brewers of Philadelphia always buying their barley at the rate of forty-eight pounds to the bushel. Salt of all descriptions pays duty at the rate of fifty-six pounds to the bushel and is in all cases sold by measure. The usage will probably be found to be different in other parts of the state, for where materials are concerned which have weights in proportion to their bulk, varying with soils and seasons, or, as in the last case, with the moisture of the air, equitable dealing could not fail to produce such differences.

In regard to the sale of anthracite coal, provided for by section twenty-nine, no mention being made of the bituminous coal, usage has established its sale by weight, and no necessity exists for providing a ratio between measure and weight.

The measure of an acre of land, of a cord of wood, or bark, the contents of a hogshead of cider, each is made the special subject of a section, while other superficial measures, the measurement of lumber &c., the contents of casks of beer, ale, whiskey, &c. &c., are left, as indeed all should be left, to the regulation of inspection laws, or to usage.

Section tenth is liable to similar objections, as providing for a peculiar form to be given to the bushel for measuring lime, which is one only of the many commodities sold by the heaped bushel. A provision for a legal standard bushel would regulate all such cases. The law provides in section seventh for both a wine and a beer gallon, a provision which the committee consider particu-

larly objectionable, the inconvenience of two different measures having the same name, is obvious, and practice confirms the conclusion, the beer gallon being no longer, as far as the committee can ascertain, in use, at least in the city of Philadelphia.

The Committee would further remark, that they have not been able to find why the regulator of the weights and measures of the city of Philadelphia, should not be subjected to the same enactments with other regulators or inspectors: the want of inspection laws to regulate the duties and fees of the office, seems to be felt by the citizen who now fills, with industry and zeal, the office of regulator of this city.

Leaving these details, the Committee would urge a general objection to the portion of the bill referring to the positive standard for weights and measures. It is that after providing for procuring those standards and distributing them, by means which would require an expenditure not at all, however, beyond the necessity of the case, it renders nugatory the whole of the work done, by providing that whenever the United States standards shall be declared, those of the states shall conform thereto. The existence of a system which has cost the state much time and labour is thereby made contingent upon their obtaining standards which *may* be those adopted by Congress at some future day, or upon the want of action of the United States upon the matter. The difficulty of a change after a complete distribution of standards would necessarily be much greater than at a time when the want of some standard was generally admitted.

With great deference to the body who are to consider the subject, the Committee have prepared an altered draught of a bill in conformity with the views which they have submitted in the foregoing, and which they respectfully submit for examination, under the supposition that legislation is, at this time, deemed adviseable. The bill containing the general provisions for a system of weights and measures, is accompanied by a supplementary one establishing the legal denominations. In regard to the manner of this appointment of regulators or sealers of weights and measures, to the securities to be required for the faithful performance of their duties, to the penalties for negligence, and to the penalties for infringement of the provisions of the bill, the Committee do not consider it within their province to offer any remarks, further than that they are of opinion that they may conveniently form a separate subject of legislation, and should not be incorporated with the general enactments.

The Committee will next proceed to a more grateful portion of their duty, than that which required the criticism of the bill referred to them; namely, to consider the case in which action by the Congress of the United States, may be deemed by the Legisla-

ture to be adviseable. Next to the inconveniences which result from a varying standard of measure and weight in the same community or neighbourhood, may be ranked those produced by a want of uniformity in the standards of different contiguous States; for it must happen in a republic organized as is our own, that the different parts of the same state have less frequent communication requiring the use of such standards, than the adjacent parts of the different commonwealths. So impressed are the Committee with this view, that they would express it as their decided opinion that the most imperfect system of weights and measures which has ever been framed, would if applied in all the states of our union, be preferable to the most perfect system which should be adopted by any one commonwealth singly. The constitution having delegated to Congress the power "to fix the standard of weights and measures," there seems to be no doubt but that that body have authority to legislate upon such a system as has been offered for the consideration of the House of Representatives of this Commonwealth, in which the object is rather to fix standards so that they shall not be liable to change for the future, than to make any innovations in existing legal standards. Indeed in most of the laws of more recent origin adopted by the several states, there is a distinct provision that when Congress shall furnish a system of weights and measures for the United States, the temporary State standards shall be made to conform to the national standard. The exceeding importance of uniformity is thus distinctly set forth, from quarters of the highest authority in the different parts of our extended republic.

In the multitude of objects to which the national legislation must be directed, it is hardly to be wondered at, that no action should have taken place upon this one. If the wants of the States, or of any of them, should be expressed, Congress could hardly fail to take up a subject upon which so much unanimity of view might be expected. Frequent consideration has been given by that body, to providing a system of weights and measures even without the stimulus just referred to, as appears by a reference to the analysis of their proceedings accompanying this report.* So far as the collection of the revenue is concerned, the object of uniformity in the standards is near its accomplishment, under directions, issued from the Treasury Department of the United States, for the distribution of standards to the Custom Houses; and thus one motive which might have induced the action of Congress is removed, and the necessity for exertion on the part of the States to secure so desirable an object, is increased. That standards issued to the Custom Houses, can be substituted for na-

* Appendix No. VI. vol. xiii. p. 232.

tional standards; even though legalized in the collection of the revenue, by an act of Congress, is obviously impossible: unrecognized by the laws of the states which contain no provisions deferring to such standards; not placed at all in some of the states, and but sparingly distributed in any, they could not even by usage and in violation of the state laws, become standards. They would tend merely to increase the diversity of standards, and unless conforming to those of the state in which they were introduced, would cause duties to be paid on commodities by one measure or weight, which were sold by a different standard. The committee would therefore most respectfully request the Managers of the Franklin Institute, to urge upon the House of Representatives, of this Commonwealth, to call the attention of Congress, through our Senators and Representatives, to the necessity of fixing the standard of weights and measures, throughout the United States; and further to suggest that the co-operation of the legislatures of other states be obtained by executive communication.

Your Committee feel satisfied that the House of Representatives of this Commonwealth may lay the subject now under consideration before Congress in a form so conveniently adapted to their legislation upon it, that a speedy action will be ensured. But should this action be delayed for two or three years, the inconvenience of action under existing laws, for such a period, would hardly counterbalance the probability of benefit to be derived from legislation by Congress. If such just hopes should be disappointed, the people of this Commonwealth would then confidently look to the care of their legislature to furnish them with standards so essential to the dealings of all classes of the community.

COMMITTEE.

Alex. Dallas Bache,
S. V. Merrick,
William H. Keating,
Rufus Tyler,
M. W. Baldwin,
Benjamin Say,
Asa Spencer,
Abraham Miller,
R. M. Patterson, M. D.
Sears C. Walker,
Benjamin Stancliff,
Thomas McEuen, M. D.
Edmund Draper,
David H. Mason,
Benjamin Reeves,
Thomas P. Jones, M. D.
Frederick Fraley,
Samuel Moore, M. D.
Samuel Hains.

AN ACT TO FIX THE STANDARDS OF MEASURES AND WEIGHTS IN THE COMMONWEALTH OF PENNSYLVANIA.

TABLE OF CONTENTS.

An Act to fix the Standards of Measures and Weights.

Section 1.—Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same: That the standard unit of all measures of length shall be the "yard" to conform to that in use in this Commonwealth at the date of the declaration of Independence, the positive standard to be obtained as hereinafter described; and that one-third of said yard shall be one foot, and one-twelfth of said foot shall be one inch.

Section 2.—And be it further enacted by the authority aforesaid, That the standard of liquid measure shall be the gallon, to contain two hundred and thirty-one cubic inches of the standard aforesaid, and no more. And that the standard of dry measure shall be the bushel, to contain two thousand one hundred and fifty cubic inches, and forty-two hundredths of a cubic inch of the standard aforesaid, and no more.

Section 3.—And be it further enacted by the authority aforesaid, That the standard of weight shall be a pound, to be computed upon the troy pound of the mint of the United States, referred to in the act of Congress, of 19th May, 1828, to wit: the troy pound of this Commonwealth shall be equal to the troy pound of the mint aforesaid; and the avoirdupois pound of this

Commonwealth shall be greater than the troy pound aforesaid, in the proportion of seven thousand to five thousand seven hundred and sixty.

Section 4.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Governor of this Commonwealth to procure within — years, from the date of the passage of this act, a standard yard to constitute the positive standard of length in this Commonwealth; said standard to be equal in length, at the temperature of melting ice, to the distance between the eleventh and forty-seventh inches on a certain brass scale of eighty-two inches in length, procured for the survey of the coast of the United States, and now deposited in the War Department. The material of said standard to be brass, and the divisions upon it to be inches and parts of an inch of the brass scale aforesaid.

Section 5.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Governor to procure, within — years after the passage of this act, for the use of this Commonwealth, a standard gallon and bushel, to conform to the provision of section second, of this act. The material of said standard to be cast brass.

Section 6.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Governor of this Commonwealth, to procure within — years after the passage of this act, a duly authenticated copy of the troy pound of the mint of the United States, to constitute the positive standard of weight of this Commonwealth. The material of said standard to be brass.

Section 7.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Governor of this Commonwealth to have the positive standards of measures of length and capacity, and of weight, provided by the foregoing sections, inclosed in suitable cases and deposited in the office of the Treasurer of this Commonwealth, to be by him, there carefully preserved.

Section 8.—And be it further enacted by the authority aforesaid, That it shall be lawful for the Governor of this Commonwealth, when he shall deem it expedient, to have tested the conformity of said positive standards of measure and weight to the foregoing provisions of this act, or to the natural, invariable standards hereinafter provided.

Section 9.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Governor to provide within—years after the passage of this act, for each of the counties of this Commonwealth, at the charge of the counties respectively, duly authenticated copies of the positive standards of measures of length, of capacity, and of weight, referred to in the

foregoing sections, of the material therein referred to, and of approved construction. And having caused the same to be duly stamped, to have them delivered to the Commissioners of the counties respectively, to be used as standards for the adjusting of weights and measures, and for no other purpose.

Section 10.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Commissioners of the respective counties, at least once in every ten years, and oftener if they have reason to believe it necessary, to cause the standards of the respective county to be examined and tried, and, if necessary, to be corrected or renewed according to the standards of the Commonwealth heretofore referred to.

Section 11.—And be it further enacted by the authority aforesaid, That it shall be the duty of the Governor, within—years after the passage of this act, to cause the positive standards herein described, to be referred to natural invariable standards, and to deposit in the office of the State Treasurer the authentic certificates of such reference, with the apparatus by which it was made. The length of the standard yard to be compared with that of the pendulum vibrating seconds at a certain and defined spot in the Independence Square in the city of Philadelphia or in some unalienable public property, at an ascertained and convenient temperature and pressure; all the circumstances of the comparison to be stated. The standard of weight to be compared with that of one hundred standard cubic inches of water, at its maximum density, and at a convenient atmospheric pressure.

AN ACT TO FIX THE DENOMINATIONS OF MEASURES AND WEIGHTS IN THE COMMONWEALTH OF PENNSYLVANIA.

TABLE OF CONTENTS.

An Act to fix the denominations of Measures and Weights in the Commonwealth of Pennsylvania.

Section 1.—Be it enacted by the Senate and House of Representatives, of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same: That the denominations of linear measure of this Commonwealth, whereof the yard, as heretofore provided, is the standard unit with the relations thereof, shall be as follows;

12	inches	make	1	foot.
3	feet	make	1	yard.
5½	yards	make	1	rod, pole, or perch.
40	rods	make	1	furlong.
8	furlongs	make	1	mile.

Section 2.—Be it further enacted by the authority aforesaid, That the denominations of superficial measure of this Commonwealth, whereof the square of the linear yard, as heretofore provided, is the standard unit, with the relations to said standard, and to each other shall be—

30¼	square yards	make	1	pole or perch.
40	square poles	make	1	rood.
4	square roods	make	1	acre.
640	acres	make	1	square mile.

Section 3.—Be it further enacted by the authority aforesaid, That the denominations of liquid measure of this Commonwealth, whereof the gallon, as heretofore provided, is the standard unit, with the relations to said unit and to each other, shall be—

4	gills	make	1	pint.
2	pints	make	1	quart.
4	quarts	make	1	gallon.
31½	gallons	make	1	barrel.
2	barrels	make	1	hogshead.
2	hogsheads	make	1	pipe.
2	pipes	make	1	tun.

Section 4.—Be it further enacted by the authority aforesaid, That the denominations of dry measure of this Commonwealth, whereof the bushel, as heretofore provided, is the standard unit, with the relations to said standard and to each other, shall be—

4 pecks to make 1 bushel.

And the minor divisions of the peck shall be its aliquot parts. Provided that the form of the dry measures shall be conical, that the diameter of the circle of the top of the measure shall be not less than one-twentieth greater than the diameter of the bottom of the measure, and the height not more than nine-twelfths of the diameter of the bottom.

Section 5.—Be it further enacted by the authority aforesaid, That the denominations of weight of this Commonwealth, whereof the troy pound, as heretofore provided, is the standard unit, with the relations thereof to said standard and to each other, shall be—

24	grains	make	1	penny-weight.
20	penny-weights	make	1	ounce.
12	ounces	make	1	pound.

Section 6.—Be it further enacted by the authority aforesaid, That the denominations of weight of this Commonwealth, whereof the pound avoirdupois, as heretofore provided, is the standard unit, with the relations to said pound and to each other, shall be—

16	drams	make	1	ounce.
16	ounces	make	1	pound.
25	pounds	make	1	quarter.
4	quarters	make	1	hundred.
20	hundreds	make	1	ton.

Bibliographical Notice.

The Elements of Mechanics, comprehending Statics and Dynamics, with a copious collection of Mechanical Problems, intended for the use of Mathematical Students in Schools and Universities; with numerous plates. By J. R. Young, *author of the Elements of Analytical Geometry, and Elements of the Differential Calculus.* Philadelphia, 1834, Carey, Lea, & Blanchard.

We cordially recommend this treatise by Mr. Young to the students for whom it is designed, as a work possessing decided advantages over others of the kind hitherto published in this county.*

We recommend it not so much for the numerous principles of mechanical science which it embodies, for the greater part of these may be found in other treatises, but for the excellence of the method pursued by the author.

The analytic method pursued by Mr. Young, has been too much neglected in the universities and academies in this country. This is owing to the deficiency of text books, and is the less surprising when we reflect that even in the land of Newton, his greatest admirers have admitted that the progress of invention in higher mathematics has been retarded by too close adherence to the synthetic method.

The principles of mechanical science may be illustrated by geometrical constructions, or by experiments with models, but neither of

* Since the above was in type, the reviewer has been favoured with the perusal of Prof. Courtenay's translation of Bucharlat's "Eléments de Mécanique," a valuable addition to American literature, of which notice will appear in a future number. Reviewer.

these methods is without limit in the extent of its applications. It is too often the case that the solution of one problem by a geometrical construction, gives no clue to the solution of the next; but there are more important reasons in favour of the analytic method; for it is our main support when experiment and geometrical construction fail.

Neither the natural spirit of inquiry, nor the demands of science, in modern times, can be satisfied with the limits to which these methods would confine us.

The earth, the common fulcrum of all our levers, pulleys, &c. must be divested of its character of fixedness, and must be regarded as assuming at each successive instant, a new position, to which it is never to return.

Here the ordinary methods of inquiry are found to be insufficient, theory and observation take the place of experiment, and the analytic method comes in to complete the solution of those problems in celestial mechanics which are beyond the reach of geometrical constructions.

This method is fully illustrated in Young's treatise, and in no other which has hitherto been placed before the American student.

The great principles of mechanics, those of the conservation of areas, of the direction of the centre of gravity, of the virtual velocities, those of least action, of living forces, those relating to axes of revolution, to stable and unstable equilibrium, are demonstrated in the clearest manner by Mr. Young, and are shown to be consequences of the dynamical formula by which the most complex system of bodies acted upon by external and internal forces, has, for any instant of time, its condition expressed by a single equation, based upon the principle of the lever, and resting upon evidence equally plain and conclusive.

The anxiety with which the student commences this department of science is removed, when he sees that by the genius of Mr. Young, those methods of investigation which have immortalized their inventors, and which have been generally considered as above the reach of ordinary minds, are rendered quite familiar, and are brought home to the solution of problems connected with the every day occurrences of life.

In making the highest departments of mathematics intelligible to ordinary minds, Mr. Young has excelled most other writers, and has conferred a lasting benefit upon the readers of the English language in every country.

We look forward to the time when the extensive use of Mr. Young's series of books in the universities and academies of our country, shall contribute in no ordinary degree to elevate the standard of mathematical science.

But let not the corporations who direct our universities, or the students for whom these courses are prepared, imagine that it is immaterial what algebra, what geometry of demonstrations or of position, what calculus is studied, so long as the analytical mechanics are brought forward to crown the course.

Though truth is one and indivisible, and though a demonstration can neither be made more nor less certain by the reputation of its author, yet a theorem which shall be indispensable in analytical mechanics, in the calculus, in the geometry of position, or in analytical geometry, may be sought for in vain in any other series but Mr. Young's.

It may be asked whether Mr. Young's course is yet complete—although enough has been done to secure him the gratitude of every lover of pure mathematics, it may be remarked that another volume —on the calculus of functions, on the summation of difficult series, on the differentials of difficult integration, with the substitutes that may be employed where definite integration fails,—a further illustration of the modes of solution of abstruse dynamical problems—with the employment of the calculus of variations, is in this country a desideratum. Something of the kind has been promised by Mr. Young, and none could so well as himself append this volume to his course. With such a course before us, and with the best edition of the celestial mechanics to be found in any language, should the highest department of science remain longer in neglect, the blame must be laid where every American student would be least desirous that it should fall.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER, 1833.

With Remarks and Exemplifications, by the Editor.

(Continued from p. 405, vol. xiii.)

51. For a *Machine for paring, quartering, and coring apples;* Cyprian C. Pratt, Paris, Oxford county, Maine, December 28.

There are two or three existing, or expired, patents for the paring and quartering of apples, and between these and that now presented to us there are several acknowledged points of resemblance; but these, the patentee says, he does not claim; all that is claimed being "the box, knives, tube, slide, and the peculiar manner of applying the power of the pulley and the lever for moving the slide to drive the apple through the knives and tube in coring and quartering it."

We do not think it necessary to give a particular description of the parts claimed, as the machine is only calculated to interest the few persons who make a business of preparing dried fruit.

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52. For the *Application of Steam to drive machinery;* John Lockwood, Sodus, Wayne county, New York, December 28.

The patentee states that he is a member of the Society of Shakers; a society existing without the marrying, or being given in marriage, of those who compose it. Now, as they do not beget sons and daughters, the continuance of their society depends upon the adoption into it of the children of others; and, were we to judge by

the specimen before us, the same system prevails in their mechanical contrivances. Many become members "after their passions have forsaken them;" but few, however, do so at an age so advanced as that of the apparatus which forms the subject of the patent before us, or the wandering Jew himself might appear among them as a stripling. This invention is no other than a steam engine, such as was put into operation by Hero of Greece. The steam is to be admitted through a hollow shaft, and is to pass off through two openings in arms, extending at right angles from the shaft, or rather through two openings in the periphery of a wheel placed upon the shaft. A sliding piece, fixed by a screw, is to be adapted to each of these openings, for the purpose of regulating the size of the aperture.

The Shakers deserve all praise for the neatness of their establishments, and the substantial excellence of the articles which they manufacture, and, undoubtedly, they may be able to make some contributions of a novel character to the useful arts; but we are not prepared to see the steam engine improved by any one who is not well acquainted with its history, and with its operation in the most perfect forms which have been given to it; and this knowledge, we apprehend, is not likely to be acquired in the libraries of the society to which the patentee belongs, or from the limited intercourse between its members and the busy world. At all events, the specimen before us is one of an "advance, three steps backward."

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53. For a machine for *Hulling and Cleaning Clover;* Elisha Rider, Livingston, Nelson county, Virginia, December 28.

A main cylinder covered with wire cards, is to be in great part surrounded by a hollow cylinder of perforated sheet iron. The seed to be hulled is carried between these by a revolving apron, and is to pass down an inclined board to a fan wheel. In the circuit of the seed, as it is acted upon by the main cylinder, it passes also between it and smaller cylinders, covered with cards, operating like the fancy cards of a carding machine. The claim is to the peculiar arrangement of the several parts of the machine.

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54. For a *Drawing and Forcing Pump;* John L. Sullivan, Civil Engineer, city of New York, December 28.

The apparatus here patented is said to be *a drawing* and forcing pump, connected with a boring for water, and called the city supply pump.

This pump is to be constructed like that described in No. 59, vol. 13, p. 325; that is, there are to be two chambers, with their pistons, connected with a single rising main. The pistons are represented as worked by racks and a pinion, precisely like that above alluded to. This pump is intended to be applied to raise water from borings in the ground, in those situations where the quantity supplied by the reservoir is greater than can be raised by a single pump.

"The principle for which this patent is claimed consists in a combination of drawing and forcing pumps, with a boring in rock or earth, made under, and according to the patents granted to Levi Disbrow."

55. For a *Thrashing Machine;* Samuel Clark, city of New York, December 28.

The cylinder in this machine is to consist of bars of square iron, secured, by riveting, to two iron heads: the concave, also, is to be formed of bars of iron; and particular directions are given respecting the *form* of the frame. The claim is to "the particular construction and form of the frame and cylinder as before described."

The lack of novelty may safely be inferred, when a claim is made to what is so unimportant as the form of the frame; and as to the cylinder, we could easily refer to one perfectly similar, were it worth while.

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56. For machinery for *Spooling Cotton Roving;* William H. Elliot, Leicester, Worcester county, Massachusetts, December 28.

The apparatus here patented is denominated the *double revolving speeder*, to distinguish it from the double speeder for which it is intended to be substituted, as producing a like advantage at a diminished expense. In this machine the spool has two motions, by one of which motions it is to twist the roving, and by the other to wind it upon itself when so twisted.

The spool is contained in a frame attached to a vertical revolving shaft, by the revolution of which, the twist above spoken of, is put into the roving. The apparatus for distributing the roving equally upon the spool, and producing the other motions required, cannot be explained without the drawing; from its apparent complexity, we should not suppose that it would attain the main object, that of diminishing the cost; the inventor, however, ought to be able to judge of this. He says, "all I claim of my invention is the double revolving motion of the spool."

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57. For an improvement in the *Process of Tanning;* Thomas W. Peachy, M. D., Williamsburg, Virginia, December 26.

(The specification will appear in the next number.)

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58. For *Preparing an extract of Bark for Tanning;* Thos. Rundlet, Bedford, Hillsborough county, New Hampshire, December 30.

We learn, *though not for the first time*, that if pulverized bark, of any of the kinds fit for tanning, be leached in warm or hot water, and the water be afterwards evaporated, "a substance, or gum, is formed;" this is the discovery; the application is the taking of this gum, or substance, dissolving it in warm water, and then applying the solution to the purpose of tanning. The advantages of this mode of procedure are set forth in the specification, but we apprehend that they are somewhat overrated, or they would not have been neglected by those interested, thousands of whom have been familiar with this *new* discovery.

59. For preparing *Hydraulic Cement;* Thomas F. Purcell and Alexander B. M'Farland, Williamsport, Washington county, Maryland, December 30.

One part of unslacked quick lime, in powder, and one part of good sand are to be mixed with hot, or cold, water enough to make them into mortar: sulphate of iron [copperas] is to be dissolved in the water used, in quantities varying from four ounces to two pound to each gallon; when a very hard cement is required, a portion of sulphate of manganese is to be added. The lime must be used very soon after it is prepared, as it sets quickly. The patentees claim to be "the first who have united and applied these ingredients to form an hydraulic or water cement, which will harden under water."

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60. For an improvement in *Stoves;* Jordan L. Mott, city of New York, December 30.

The claim made under this patent is to the "combining the open Franklin with the close stove, by connecting the grate, which is thrown back, by a plate, or plates, with the close part of the stove; the one stove being thus placed, as it were, above, or higher than the other."

The lower portion of this stove is to be in the form of the open, or Franklin stove, and is to contain a grate for fuel; the plates forming the exterior of it are to be continued up to any convenient height, and this upper part constitutes the close stove. There may be a pipe, from the top plate to carry off the smoke; and it is proposed to divide the close part into two compartments, by a soap stone partition, descending from the top plate, to a considerable distance down; the anthracite may be put through an opening in the top plate over the front division, and it will then fall into the grate; the front plate being curved inwards, so as to conduct the coals over the upper bar; this constitutes the principal novelty, and is the foundation of the claim.

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61. For a *Machine for Drafting;* James C. Moore, Richland, Belmont county, Ohio, December 30.

The instrument for drafting consists principally of a circle and a scale, with divisions, the description and mode of using which occupy a very large space, although the important information of what is claimed is omitted; the drawing too, which accompanies it, is without any written references. From our examination of the affair, we have come to the conclusion that it does not offer any special advantages, or contain any new principle.

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62. For *Bedstead Fastenings;* George Porter, Cincinnati, Ohio, December 30.

The fastenings described, like many which have preceded them, operate on the principle of the wedge, but in their form and mode of application they appear to possess novelty. All, however, that we shall do as regards this patent, is to give the claim, which is to "the

particular construction of the corner iron upon the post, its length being sufficient to embrace the whole thickness of the rail; with the form of the wedges, they being slightly curved, bring the bearings in the centre, thus rendering them less liable to break, and offering other advantages in the construction; the form and manner of inserting the irons in the rails, and the general arrangement of the whole for the attainment of the ends proposed."

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63. For *Constructing Cisterns;* George Tibbetts, jr., Jamesville, Onondaga county, New York, December 30.

A circular pit is to be dug, of such diameter and depth as may be required, and this is to be planked round with plank jointed in the manner of staves, the space between these and the ground being closely filled in. Hydraulic cement is then to be placed around on the bottom of the pit, so as to be in contact with the planking; upon this a second tier of plank is to be raised at the distance of one or two inches from the former; into this space, grout of hydraulic lime, either alone, or mixed with stones and gravel, is to be poured, so as completely to fill it up. Where water, lime, and stone are abundant, the space between the two plankings may be six inches. The inside of the inner planking is to be plastered with the hydraulic cement, and the top also, including both plankings, is to be securely covered with it, so as to exclude the air and moisture. The bottom of the pit is likewise to be thus plastered, then covered with stone, or brick, and grouted. The claim is to "the raising the two tubes of wood, and filling the space between with grout, or stone, or gravel, and grout, and excluding the air and water from the inner tube, whereby it is preserved from decay and the attacks of worms."

On the 19th of November, a neighbour of the present patentee obtained a patent for constructing cisterns, by applying the hydraulic cement to the earth, without the employment of any partition or walling; (see page 322, vol. xiii.) we think so little of these plans, as improvements, that we would not, were we in want of a cistern, accept of a right from either patentee, under the condition of using it. We do not like the intermixing the wood and the cement, being convinced that one of them will be likely to crack the other. A wall of hard brick, or of rough stone, laid in hydraulic cement, and plastered over, would be but little, if any, more costly than the plans in question, and although unpatentable, would be incomparably better than either of them. The idea of effectually protecting wood from the action of water, by an inch or two of water proof cement, is altogether fallacious.

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64. For an improvement in *Bricks, and the machinery for making them;* Thomas A. Sherman, Scriba, Oswego county, New York, December 30.

The title of this patent, as given in the petition, is, "an improvement in the composition of mortar for making bricks water proof and

fire proof; and also machines for mixing the mortar, for brick, and also a machine for moulding brick."

In mixing the materials, half a bushel of unslacked lime, and half a bushel of salt are to be added to every barrel of water employed; and this we are told, will make brick which will stand in fire and in water.

The grinding machine is a circular trough to contain the mortar, and within this is a roller consisting of six or more wheels revolving upon a shaft drawn round by a horse, and having its inner end properly attached to a vertical shaft. The wheels are to diminish in diameter, as they approach the centre, and each of them is to be covered with a hoop, or tire of iron. These wheels are placed a small distance apart, and iron scrapers, fixed upon bars, pass in between each of them, to scrape out the mortar. At each of these spaces other pieces of iron, like the coulter of a plough, descend down into the mortar, to cut and divide it as the wheels go round.

The machine for moulding, consists of a table, or platform, along which a carriage is to be drawn towards either end, by means of a crank, from the shaft of which ropes pass over pulleys. The carriage is to contain a mould for eight bricks, and when this mould is at the middle of the table, it stands between cheeks which rise a few inches above it, and form two sides of a hopper to receive the mortar; whilst two lids, each of which when down covers half the mould, form, when raised, the ends of the hopper; into this, clay enough is to be thrown to make the bricks, and on shutting the lids down it will be squeezed into the moulds; these being drawn forward, the lids operate as a strike; the mould is then to be removed, and a new one applied.

The inventor says—"I claim to have discovered the composition above described for making brick, and to be the inventor of the two machines above described."

By turning to the patent of Nathaniel Adams, at p. 386 of the last volume, it will appear that, so far at all events as the grinding or mixing machine is concerned, he is not the sole and entire inventor of it, and that his claim is, therefore, much too broad.

The moulding machine, as it is presented in the specification, appears to us to be a very imperfect instrument. No mode is described for regulating the quantity of mortar thrown in; for forcing down the doors by which it is to be made to fill the moulds; or to insure the regular distribution of the clay.

As regards the composition, we do not know what is intended by its producing a brick "which will stand in the fire," as it certainly will not stand as a fire brick; it would not be easy to make a composition for brick which would fuse more readily than that proposed; the alkali in the salt, and the quicklime mixed with the clay and sand of the original compost, will very readily run into glass.

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65. For *Steam Valves, Force Pumps, and Wheels for Locomotive Engines;* Stephen H. Long, Colonel in the United States

Army, and attached to the corps of Civil Engineers; city of Philadelphia, December 30.

The claims under this patent are to the construction and application of a *double slide valve*, for the purpose of interrupting the passage of the steam into the cylinders at half, or less than half, stroke. The adaptation and construction of a single valve chamber for the force pump, in which all the valves are situated one above another, there being any number of them which may be deemed desirable, as one, or more, suction, and one, or more, ejection, valves. The mode of connecting the valve chamber with the force pump, so that the water is first drawn into the pump through the valve chamber, and forced out towards the boilers, through the upper part of the same. The mode of attaching a hand pump to the valve chamber. The employment of double felloes for the wooden wheels of rail-road carriages, and the application thereto of circular hubs of cast iron, formed of one single casting.

The double valve consists of two separate slides, one of which is, like the ordinary slide valve, to admit the steam alternately into each end of the cylinder, the other is to cut off the passage of the steam into the steam cylinder at about half of every stroke of the piston. Without the drawings it would be extremely difficult to describe the particular mode of constructing and regulating the steam ways of these valves, as adopted by the patentee, and we do not think it necessary to make the attempt. The same remark will apply to the force pumps.

As regards the cast iron hubs, we are told that the improvement consists in the application to locomotive engines, of such iron hubs as R. Imlay, of Philadelphia, has applied to burthen and passage cars. This, we apprehend, is a claim which has no foundation whatever upon which to establish a patent. The taking a wheel, or a part of a wheel, invented by another person, and applying it to a carriage of another kind, is, certainly, not an invention or discovery. Mr. Imlay has not thought proper to take a patent for the hub in question, nor are we aware that there is enough of novelty in it to sustain one, but however this may be, the contrivance cannot be claimed by another.

The *double felloes* which compose the rim of the wheel, are to lap over each other so as to break joints, each being halved out at every spoke, so as, when put together, to form a mortise. The felloes are to be united by iron rivets passing through them, near to the joints; and before hooping, they are to be further secured by clamps of iron which cross them transversely, having a jog, or half head, turned down at each end to embrace the felloes. Over these is put the iron tire, and the bolts securing it on pass through holes prepared in them for that purpose.

We do not perceive in this arrangement any thing which is likely to obviate the difficulty experienced in keeping wood and iron tight together in locomotive engines and cars. The expansion and contraction of the wood from moisture and dryness; the oxidation of the

iron, and the sure effect of continued vibration, have hitherto destroyed junctures which were apparently so firm that no ordinary force could affect them; we shall be glad to learn that such is not the case with those made upon the plan here proposed.

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66. For an improvement in *Butt Hinges for Tables;* Humphrey Treadwell, Hyde Park, Dutchess county, New York, December 31.

This is not properly a butt, but a table joint hinge; it is intended as a substitute for the rule joint of dining, breakfast, and other tables, and is so made as to extend along the whole length of the leaf, and to show a quarter round of metal instead of wood. Its form may be readily conceived by supposing the half of a butt hinge to have the wire tube extended from end to end, without being divided into separate knuckles, and that there were as many of these half hinges as would extend along the whole joint; the leaf and bed of the table are then to be rebated and hollowed so as to receive the strap of the hinge, and one half of the barrel, or tube; when this has been properly done, on screwing the half hinges alternately on the bed and the leaf, so as to form close joints, this part of the work will be finished, and the leaf, when down, will show a small, continuous, quarter round of metal.

It is proposed to make these hinges of sheet brass, by bending the separate pieces over a wire, in which case the strap part will be double; and this, probably, will be the best way of forming them; the patentee, however, does not confine himself to this method, but claims the general construction of such hinges, whether made of cast or of sheet metal.

We think the plan a good one, as the appearance of the joint will be neat, whilst its strength will be much greater than when made in the old way. It will be somewhat, but probably not much more costly.

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67. For a *Coffee Roaster;* Amos Ransom, Hartford, Hartford county, Connecticut, December 31.

The part to contain the coffee may be in the form of a common iron pot, to which is to be fixed a framework of iron, that will sustain a vertical shaft, having knives, or scrapers, at the bottom of it, which are to revolve nearly in contact with the bottom of the pot. On the upper end of this shaft there is to be a beveled wheel, and into this gears a similar wheel which is to be turned by a handle on the end of a horizontal shaft. This constitutes the whole invention, and as it is not quite so good as, and probably no cheaper than, the well known cylindrical roaster, it does not bid fair to be very extensively used.

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68. For an improvement in *Rail-road Cars;* Abel Look, Waterford, Saratoga county, New York, December 31.

This device consists in making each wheel fast to a separate axle, the inner end running in bearings under the centre of the car, and

the outer end in the frame work, outside of the wheel. The object is said to be, the enabling the car to run with facility upon a curved as well as on a straight road. In speaking of this mode of construction the patentee says, "I am aware that in rail-road cars the axles have been so made as to allow one wheel to turn thereon, whilst the other was made fast, the axle being allowed to revolve; I am also aware that it has been proposed to make the wheels of common carriages, or wagons, each fast to its own axle, the axles turning in suitable bearings; but the adaptation of wheels, each fastened to its own axle, to rail-road cars, in the manner, and for the purposes herein described, I claim as new, and as my own invention; and it is for this, specifically that I ask a patent."

We do not perceive any difference in the effect to be produced by this plan and that which results from the allowing of one wheel to be loose on the axle; it may also be doubted whether there is enough of novelty to sustain a claim to a patent in the mere adoption of a known method of fixing wheels, in the construction of rail-road cars.

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69. For an improvement in *Coach Steps;* Charles M. King, Newark, Essex county, New Jersey, December 31.

The joints of coach steps, as usually constructed, depend for their strength upon a single projection across the end of each side piece; and as the force to which they are subjected is frequently very considerable, this is apt to give way. The patentee makes his steps with a double bearing. In addition to that across the back ends of the horizontal side pieces of the upper step, which rest against the back ends of the perpendicular pieces to which they are attached, he makes strong projections from the back edges of the perpendicular parts, to receive the upper ends of the projections on the horizontal pieces; a step thus made cannot give way unless both bearings should break at the same time. The middle and lower joints are constructed upon the same principle.

These projections constitute the only difference between these and other coach steps, and comprise the whole claim.

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70. For a *Lath Cutting Machine;* James Mead, and Aaron W. Pearson, executor of Willis Pearson, Lebanon, Warren county, Ohio, December 31.

By the description, it appears that the laths are to be cut from a round log, by means of two long knives, one of which is to cut the sides and the other the ends of them. The log is to be hung upon centres, and the two knives are to be worked by levers attached to a shaft, having two cranks upon it, moving one of the knives vertically, and the other horizontally.

The specification is written with intelligence, but still it is defective in not giving a clear description of the machine; we see enough of it, however, by the aid of the drawing to doubt of its ever producing a lath. The knives are straight, and must not be less than four feet in length, and one of them is to be pushed in upon the periphery

of a solid log, so as to cut a lath. The power required to effect this, and to hold the log whilst it is done, would be immense, unless logs could be found as soft as cheese.

As the cutting is to be in a spiral, from the surface to the centre, there is a contrivance for raising the log as the laths are cut. There is some skill manifested in the mode proposed for effecting this, and in other movements, but we really think it altogether misdirected.

There is no claim made, and we apprehend that if the machine performs its office, it is sufficiently original to sustain itself as a whole.

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71. For an improvement in the *Balance*; Benjamin Morrison, Milton, Northumberland county, Pennsylvania. Patented February 13th, 1833. Patent surrendered and reissued December 31.

The form of the specification and of the petition in the case before us, gives no indication of the surrender of the former patent, no allusion whatever being made to it. The law, it is true, does not prescribe any particular form for reissued patents; still, it would seem necessary, from the nature of the case, to state in the new petition what had been done, and the reason therefor. As, however, the former patent has been cancelled at the office, we presume that the new one would be good in law, although the form of obtaining it may have been defective.

The general tenor of the new specification is the same with that upon which the patent was originally issued, but there is now a claim added to it in the following words—

"What I claim as new, and invented, discovered, or applied by me, are the pendulum rods and weights attached thereto, as also the rings in which the dishes set, connected with the pendulum rods, and the mode of applying the same to the beam."

Our remarks on the former patent may be seen at p. 92, vol. xii. and we know of nothing to induce us to vary them; the things claimed we do not consider real improvements, as the weights permanently suspended to the scales must lessen their sensibility, and at the same time render it necessary that they should be fixtures.

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72. For an improved *Cooking Stove;* William Shaw, Albany, New York, December 31.

This stove is represented in the ordinary square, or, rather, parallelogram form, and has folding doors in front which enclose a grate for anthracite; at the back of the grate there is to be an oven, one portion of the draft passing above, and another below it, to a smoke flue. The patentee claims "the general form and construction, as specified, and the particular mode of producing and applying heat, as being essential to, and making the ground work of, the improvement." We do not see any think in the "general form," or in the "particular mode of producing and applying the heat," by which to distinguish this stove from some, and indeed from many, others.

73. For an improvement in the construction of *Bedsteads;* Isaac Eaton, Mount Gilead, Loudon county, Virginia, December 31.

The object of this invention is to tighten the sacking bottom with facility, and to convert a low into a high post bedstead, for the hanging of curtains. The description, as given, appears somewhat formidable, but the result does not correspond thereto. The sacking is to be tightened by making one of the side rails revolve, applying a rag wheel and pall at the ends to keep it in its place. The posts are to be lengthened by inserting two stout wires in the top of each of them, one of which is to pass straight up to the tester, and the other to reach it in an oblique direction, so as to form a brace.

The claim is to the "constructing of bedsteads, by which the sacking bottom can be strained with a single revolving rail; and the curtain frame sustained by the iron braces."

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74. For a machine for *Extracting Stumps and moving heavy bodies in constructing roads, &c.;* Elias Fraser, Hector, Tompkins county, New York, December 31.

Those persons who have seen the hook at the end of a lever, or beam, for rolling and turning logs at a saw mill, have seen something bearing a strong resemblance to this machine. A beam of wood sufficiently strong for the intended purpose is to be prepared, and at a convenient distance from one end of it a mortise must be made through to receive a hook, or claw, like those alluded to, and like them it is to be kept in its place by a pin. A second hook is to be attached to the beam by means of links, a little back of the former; and when a stump is to be removed, one or both of these hooks are to be attached to it, and "team power" applied to the beam to drag it from its place. On one side of the beam there may be a blade, or share, projecting a short distance, to lay hold of articles too small for the hooks. We are told, in conclusion, that when the stump refuses to yield on being pulled, the force may be applied by a circular movement of the team.

There is no claim.

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75. For a machine for *Splitting Leather;* Joseph P. Shaw, and John C. Briggs, Boston, Massachusetts, December 31.

This machine appears to be intended for reducing strips of leather to a proper thickness, by drawing them between a knife and a straight piece of metal parallel to the knife, and at such distance from it as shall be equal to the thickness intended to be given to the leather; in its general construction, therefore, it is similar to other machines intended for the same purpose. The improvement claimed consists in a spiral spring that bears down the ends of the straight bar, which, when the leather is to be introduced, is raised up by a lever for that purpose. But one mode, and that a peculiar one, of fixing such springs is alluded to, and the claim is confined to "the manner as above de-

scribed," which springs may be applied in various other ways, equally good with that set forth.

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76. For an improvement in the construction of *Friction Rollers*, to be applied to machinery of various kinds; Benjamin Stancliffe, city of Philadelphia, December 31.

The friction rollers here patented are intended as an improvement upon those of Garnett, and it is proposed to apply them to the axles of carriages and of cars for rail-roads, as well as to many other kinds of machinery. It is observed that the friction rollers, as heretofore employed, have been applied to the axis only, whilst in carriages, cars, &c. there is frequently a great lateral thrust, and consequently a very considerable friction upon the shoulders, which has never been provided for; the patentee, therefore, places friction wheels bearing on the shoulders, in addition to the rollers acting on the sides, of the axle.

The claim is to "the application of friction rollers with their axes at right angles to each other, so as to cause them to bear laterally, as well as directly, upon the axles and boxes of machinery, upon the principle herein set forth, whether they are constructed in the manner described, or in any other involving the same principle."

There may be cases, but they are very few, in which such rollers may be of advantage; we have several times had occasion to remark that wherever there is any jolting in the motion of machinery, Garnett's rollers have, after a little wear, been found worse than useless; there is nothing in the plan before us, to lessen this objection, and as the end rollers must have an extremely narrow bearing, they will, in such cases, fail before the others. We deem them specially inapplicable to cars and carriages.

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77. For a *Cheese Press;* Asahel Tyrrill, Fowler, Turnbull county, Ohio, December 31.

This press is to be made with two cheeks, a bed, and a follower, like the ordinary screw press. The cheeks are to be grooved to receive two cast iron pieces which project up from the follower, and to slide in them. These have each teeth on one side, forming a rack; and a cast iron shaft, or roller, extending from cheek to cheek, has a pinion on each of its ends, taking into these racks. A hole through the middle of the roller receives a lever by which the follower may be raised, or forced down; and when the cheese is under pressure, a weight at the end of this lever serves to render it continuous. The claims are principally to the making of certain parts of cast iron, as "the cast iron boxes, or grooves—the cast iron roller, with the cogs cast solid on each end—the cast iron follower, with the cogs cast solid thereon." We think that such claims are altogether unsubstantial, referring neither to invention, or discovery, but merely to the employment of a particular and well known material.

78. For an improvement in the common *Cotton Spool, or Bobbin;* Nathaniel Rider, Milbury, Worcester county, Massachusetts, December 31.

It is stated, that the bobbins of wood as usually made, have an unequal and too great friction upon the spindles, the friction occasioning the bobbin to go sometimes too fast, and sometimes too slow, and frequently causing the breaking of the thread. The patentee, instead of making the boxes of the bobbins of wood, intends to form them of metal; these metallic boxes not being so deep, or thick, as those made of wood, the bearings and friction are consequently much diminished, and the bobbin follows the spindle with a more easy and uniform motion; this motion, too, may thus be greatly accellerated, allowing, as it is said, of the spinning of almost double the quantity of yarn. The improvement claimed is confined to "the introduction of metallic boxes into the bobbin used in spinning cotton warp, yarn, or twisting cotton thread."

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79. For *Ceiling Ships and other Vessels;* Andrew M. Frink, New London, Connecticut, December 31.

(See specification.)

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80. For a *Door Latch, or Latch and Bolt;* Philos Blake, Eli Whitney Blake, and John Adams Blake, New Haven, New Haven county, Connecticut, December 31.

This invention is said to consist in a latch and bolt of a new and improved construction, intended as a substitute for a mortise latch, or mortise latch and bolt, and is denominated the *Escutcheon Latch*, or *Escutcheon Latch and Bolt.* The latch is made much in the manner of the spring bolt of a lock, but the shank which goes within the door is made round, to receive a spiral spring, by which the bolt is to be protruded. The bolt passes through a square hole in a plate on the edge of the door, and it is to be let in by boring a round hole in the centre of the rail; to receive it, and the spring which surrounds it, at the inner end of the shank a screw is cut to receive a piece of metal which is to be placed thereon. A round hole of about an inch and a quarter in diameter, is to be bored through the door, with its centre exactly opposite to the centre of the bolt. This forms what is called the chamber, and is to receive the tumbler, and the other parts to which the knobs on each side of the door are connected, and by means of which the bolt is to be turned. This chamber is to be covered on each side of the door by an escutcheon, of sufficient diameter to allow of its being fastened by screws. The particular construction of the part concerned in operating upon the latch, within the chamber, could not be made plain without the drawings, or the extension of this article to a greater length than would be convenient.

The claims are to the "supporting and guiding the interior end of the latch by the tumbler, either *directly*, or *indirectly*, through the

medium of a rocker. The supporting the tumbler exclusively by the escutcheons. The attaching the knobs directly to the tumbler, without the introduction of what in common locks is called the *spindle.* The conformation of the several parts, by which they are respectively adapted to the peculiar construction referred to. The fastening the door by a thumb bolt to the tumbler, to prevent it from turning on its axis."

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81. For a machine for *Hulling Clover;* Israel Correll, Shanesville, Tuscarora county, Ohio, December 31.

There is to be a cylinder coated with emery, and a concave, which is to be regulated by screws to keep it at a proper distance; the feeding is to effected by an endless apron; and the patentee says that "all the above improvements are relied on;" and certainly if long experience will enable us to rely upon any thing, he is correct, as the same methods have been adopted, and varied in different ways, by others, through a series of years; and although this may not contribute much to the security of exclusive possession, it will justify the implied confidence in the goodness of the machine.

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82. For a *Churn;* Iram Brewster, Blenheim, Schoharie county, New York, December 31.

A shaft having four cranks upon it is to work four dashers, in the common upright churn. Should any one chose to employ either three or five dashers, they will steer clear of this patent, and we doubt the danger of using the intermediate number.

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83. For a *Churn;* Uriah L. Clark, Menor Township, Lancaster county, Pennsylvania, December 31.

Although we have given to this instrument the brief name of churn, it has received from the patentee the more sonorous and circumlocutory appellation of "an improvement in the useful arts, being a machine for churning butter from cream, or milk, entitled Clark's improved churn." If the patentee had contrived a machine by which he could churn butter from another, and cheaper fluid, than cream, this, indeed, would have been an improvement in the useful arts, but that of making butter will be left pretty much in the state in which it existed previously to the introduction of the present *improvement,* which consists, simply, of the common barrel churn, with revolving dashers. According to the terms of the specification, however, "the vessel to contain the cream may be made of tin, sheet iron, or wood." The shaft, too, is to be made of iron, and is to be turned by a crank, and the churn may stand upon four legs. "The dashers are made of thin pieces of board, with an oblong opening in the centre of each." There is likewise to be an opening in the top of the vessel to admit of putting in the cream, and of removing the butter; and "the *inven-*

tion here claimed consists of the above described machine, or apparatus, for churning butter, with the arrangement of its several parts."

Our confidence in the general intelligence of the American dairy maids is such, that we omit the account given of the "operation" of the said machine, leaving this to be discovered by themselves.

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84. For *India Rubber, Water Proof, Mail, and Traveller's Bags;* Edwin M. Chaffee, Roxbury, Norfolk county, Massachusetts, December 31.

Cloth of any suitable kind, which has been coated on one side with India rubber, is to be cut so that two pieces when put together, shall form the intended bag. They are to be placed together, with the india rubber coating outwards, their edges coinciding, and are to be united by a strip of cloth coated with India rubber on both sides, which strip should lap half an inch or more on each piece. This first bag is to form the lining, which is to be covered with stout cloth of a similar form, but somewhat larger, and coated on both sides; when the two are firmly cemented together, the bag is so far complete, and is ready to receive a metallic rim, or clasp, of any convenient construction, which may be secured by a lock.

The "claim is to the construction and mode of manufacturing water proof bags, from India rubber cloth as above described."

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85. For *Water Wheels;* Zerah Blakely, Wilkesville, Gallia county, Ohio, December 31.

The buckets are to be placed around a solid shaft, in a form resembling the teeth of a rag wheel. Thus, suppose the shaft to measure seventy-two inches round, and that there are to be eight buckets; eight pieces of plank, each nine inches long, nine wide, and three thick, are to be made into a wedge like form, excepting that the sides which are to be outwards, should be made somewhat convex. The shaft is then to be made eight square, for the width of the buckets (nine inches,) and these are to be planted on. The face of each bucket, upon which the water is to strike, will then be nine by three inches; and the opening for the water will be three inches wide. The buckets are to run in a circular curb, which may extend one-fourth of the way round the shaft. Some variations in the manner of fixing the buckets are described in the specification, but being entirely unable to comprehend their use, we do not think it worth while to particularize them.

The drawing represents three such wheels on one long shaft, and we are told that there may be any number, and that they may be placed either vertically or horizontally. The patentee says, "I claim the particular improvement in the water wheel above specified." We are apprehensive that the wheel upon which this is an improvement, must be a very bad one, such a one, indeed, as could not easily be made worse. The way in which, in its present improved form, it is to attain the object of "preventing the

great loss of power occasioned by back water," we leave for others to discover.

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86. For an improvement in the *Structure and Action of the Piano Forte;* Alpheus Babcock, city of Philadelphia, December 31.

This improvement is said to consist in three particulars; first, in the arrangement by which the motion of the key is communicated to the hammer; secondly, in the preparation of the hammer: and thirdly, in the arrangement of the damper.

In the first part, the invention claimed consists in the novelty of the particular arrangement of the respective parts, and not to any of them individually. We might, probably, without the drawing, describe this part of the action so that it would be understood by a competent workman, but it would not be easy so to do, and the description would not interest any other person; it is perfectly well represented in the drawing, and clearly described.

In preparing the hammer, the piece of wood which is to be covered with the leather to strike the string, is made concave, to receive a small roll, or pad, of woollen cloth, or other suitable material, over which the covering of leather is to be placed in the usual way.

The claim is to "the substitution of cloth for the layers of leather heretofore used." The advantage of this is said to be that the uniform and regulated hardness given to the roll, particularly when of cloth, renders it more perfectly elastic, and prevents its indentation and hardening by use.

The wire which raises the damper rests upon the inner end of the key, by which it is raised; but its gravity alone is not depended upon to cause it to descend, its tendency to do so being aided by a slight lively spring, placed under the key, in such a way as to act on the lower end of the damper.

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87. For *Rollers for Rolling Iron and other metal;* Rufus W. Bangs and Stebbins D. Walbridge, Bennington, Bennington county, Vermont, December 31.

The patentees inform us that their improvement consists in the construction of rollers by which metal may be rolled of a given width, and of a regular taper from end to end, adapting it to many purposes, such as carriage springs, plane irons, &c. To regulate the width the driving roller is to be grooved, and to regulate the thickness, the groove must be sunk, or the roller made eccentric, so as to produce the intended effect.

There is no claim made, and as there is nothing novel in the plan, there was no room for one. We have had occasion to speak of such rollers repeatedly, and their operation is so obvious that any one proposing to offer them to the public as a new invention, might well pause before doing so, although he had not been so situated as to be actually informed of their previous employment. The world is large;

there are many ingenious heads and skilful hands at work, under the strong stimulus of interest, leading them to devise the best means of facilitating the operations in which they are engaged; and it is of no avail to a patentee to say that he did not know of the previous existence of the thing which he has patented, as the law does not intend to give him an exclusive right in consequence of his ignorance.

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88. For *Fireplaces, or Stoves;* John E. Cayford, Milburn, Somerset county, Maine, December 31.

The object in view in this patent is the construction of an open fireplace, for cooking, and heating rooms, by means of a small quantity of fuel; and we are told of many things which *may* be done in furtherance of this object; as, for example, that the fireplace may be made of cast or sheet iron, or of brick, or in part of one, and in part of another of these materials; and that there may be an oven, &c.&c. Among the things most important to be told in a specification, however, is what the patentee has invented; a thing, it is true, very frequently omitted; sometimes, no doubt, because the necessity of it is unknown, and sometimes because it would be impossible, which, it must be confessed, is a pretty good reason, and one that, we think, would fully apply in the case before us.

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89. For a *Machine for reaping Grain;* Obed Hussey, Cincinnati, Hamilton county, Ohio, December 31.

The mowing machine here described is to run upon wheels attached to the frame or carriage, in front of which the horses draw. From one side of the frame, a platform extends out several feet, say five or six, and upon the front edge of this is placed the apparatus for cutting the grain; which, as it is cut, is to fall upon the platform, whence it is to be gathered into bundles. The platform is sustained at a suitable height from the ground by means of a wheel, or roller, under the back part of the machine. The cutting apparatus consists of rows of fixed and of vibrating teeth, the fixed teeth being, in the specification, called the guard. These teeth are to project forward from the front edge of the platform, are to be seven or eight inches long, and three inches apart; they are nearly straight, but pointed towards their ends, and in their whole appearance resemble a large comb, or rake. The guard, or comb is double, being formed of two plates of metal, but the teeth are united at the points; it is, therefore, like two combs placed one above the other, at a small distance apart, their only connexion being the joinings of the points of the teeth. In the space between these teeth the cutting instrument is placed, and is made to vibrate; this is formed with teeth like those of a saw, but having each edge made sharp; the points of the teeth are at the same distance apart as those of the guard.

The main wheels of the machine are made fast upon the axle, upon which there is a toothed wheel so geared into other wheels as to give motion to a crank which vibrates the cutters between the guard teeth; as the machine is drawn forward, therefore, the grain, or grass, is

embraced between the teeth of the guard, and is cut off by the vibration of the cutters, it then falls back upon the platform.

"In this machine the following points are claimed as new and original. 1st. The straight horizontal saw, with the teeth sharp on their two sides for cutting grain. 2nd. The guards, forming double bearers above and below the saw, whereby the cutting is made sure, whether with a sharp or dull edge; the guards at the same time protecting the saw from rocks or stones, or other large substance it may meet with. 3d. The peculiar construction that the saw teeth may run free, whereby the necessary pressure and consequent friction of two corresponding edges cutting together, as on the principle of scissors, is entirely avoided. 4th. The peculiar arrangement by which the horses are made to go before the machine, and the general arrangement of the parts as above described."

On the 3d of May, 1831, W. Manning, of New Jersey, obtained a patent for a machine for cutting grass and grain, see vol. viii. p. 195, essentially like that now patented. The comb, it is true, is not double, in that machine, but this is not a point of importance; the cutters are perfectly similar, and are made to vibrate upon the comb. The first claim, therefore, in the present patent necessarily falls to the ground, and with it the whole superstructure. The claim in the first patent is to "the combined action of the teeth and cutters." We are not quite sure that the double teeth are an improvement, as there will be much danger of stubble insinuating itself within, and obstructing them.

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90. For *Supplying Steam Boilers with Water;* William W. Van Loan, city of New York, December 31.

The apparatus here patented is intended to keep the water in a boiler uniformly at the proper height, and to afford the means of ascertaining that it is so.

The apparatus described by this patentee is arranged with considerable skill, and looks, in the drawing, as though it would answer the intended purpose; where, however, there is an array of valves, pistons, stop cocks, &c. to be acted upon under the influence of high pressure steam, things do not go on so quietly and uniformly as might be desired; contraction and expansion, adhesion, the introduction of air, the insinuation of steam where it was not designed to go, the destruction of packing, the defect of lubrification, and the many other ills which such a machine is heir to, defeat the most exact calculations, and the most ingeniously arranged contrivances. Under these circumstances, therefore, we are never safe in pronouncing favourably of the practical operations of an untried project; nor, indeed, will those who are well informed upon the subject of mechanics, be very ready to do so in machines of much less complexity than the steam engine.

Should the apparatus be found to answer in practice, we will hereafter present to our readers the whole description, with the necessary figures; but, without the drawings a particular description cannot

be given. The general principle upon which the patentee has proceeded is the same upon which several other contrivances for a like purpose have been dependent, but the present is sufficiently novel in the arrangement of its parts, not to interfere with them; this principle is the equality of the pressure exerted by the steam in the upper, and by the water in the lower, part of the boiler, in consequence of which, when water in any vessel is subjected to the pressure of both, it will flow therefrom as it would if not subjected to the action of either. One of the instruments proposed to be used is so simple that its action will be readily understood. It is merely a large tube, opening into the boiler just at the water line, and furnished with two stop cocks, placed at such a distance from each other as to allow of a proper supply of water for a single stroke of the engine to be contained between them. The keys of these cocks are connected by a rod so that when one is closed, the other is open. When the outer cock is opened, water may flow into it from a reservoir, and when it is closed, and the other opened, this water may flow from the tube into the boiler.

The claim made is "to a combination of apparatus operating upon the principle described, in such manner as to be self-acting; and the application of said combination to a purpose that has not hitherto been accomplished, namely, to the feeding of boilers containing steam, and effecting this feeding in exact proportion to the waste of water by evaporation, even at times when the engine is at rest, or to boilers to which no engine is attached."

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91. For *Heating Air to be conveyed to Fires;* William H. Miller, Hindsdale, Cattaraugus county, New York. December 31.

This is one of those affairs with respect to which it is perfectly convenient and proper to omit every thing which would bear the appearance of a claim, as the apparatus patented differs about as little from some which have preceded it, as two instruments for the same purpose, and intended to be alike, usually differ, when made by different hands. Under the name of forge backs, we have described several similar contrivances, as may be seen by turning to p. 165, vol. x., p. 380, vol. xi., and other places which it is not necessary to point out. The first of these manifested an acquaintance with the subject, and skill in carrying the principles into effect; those which have succeeded it have been uniformly inferior to it although they were called *improvements*.

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92. For a *Suction Pump*, called the Bellows Pump; Allen H. Mathes, Madisonville, Monroe county, Tennessee, December 31.

The kind of pump here patented is described in most of the books treating upon hydraulics; we could find it in, at least, a dozen works upon our own shelves, and have had occasion to refer to it several times in our Journal. In illustrating the nature of the common pump, we have cited it both in lectures and in conversation, and hundreds of others have done so before us. To make a pump like the one here

patented, all that is necessary is to add a valve, opening outwards, to the nozzle of a pair of bellows, and to place round the valve, or click hole, on the lower board, a tube which shall descend into a vessel of water. On working the bellows, you will blow out water instead of air, and possess a perfect "bellows pump."

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93. For a *Straw Cutter;* John M. Tilford, Rutherford county, Tennessee, December 31.

A cylinder, having a cutting knife placed obliquely along it, is to be made to revolve against the end of a cutting box. Upon one end of the cylinder there is to be a fly wheel, and upon the other a crank, or whirl; the straw is to be fed by hand, with the kind of comb, or rake, usually employed for that purpose. Who was the *first inventor* of such a machine, it would in these days be difficult to tell.

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94. For a *Pulp Sifter;* Sydney A. Sweet, Tyringham, Berkshire county, Massachusetts, December 31.

Instruments for the purpose to which that before us is applied, have been usually called *pulp dressers.* That now patented is very simple in its character, operating like the common sieve. A plate of metal is to have slots or openings made through it, of such width as will permit the finely ground pulp for paper to pass through, whilst it will detain the knots and lumps which may exist in it. This plate is to be surrounded by a wooden frame, of such height as will allow the prepared pulp to be passed into it, and to this strainer is to be given a jarring motion up and down, by which it is to be made to strike upon any hard substance. The mode of filling it with the pulp, and of giving to it the requisite motion, is left to the determination of the user, as it is stated that these things may be effected in various and obvious ways.

The claim is "to the before described manner of constructing the horizontal pulp sifter, and the mode of operating it for sifting or dressing pulp for the manufacture of paper."

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95. For *Making Hoops;* Moses Granger, Utica, Oneida county, New York, December 31.

All that is prescribed in this patent, is the cutting of stuff to be made into hoops, from the surface to the centre of a round log, so as to cross the growth of the wood, or what in this specification is called the *racking grain.* No particular machinery, or manner of cutting, is claimed, but simply the principle of sawing the timber for hoops in the direction specified, as regards the grain. A round log, it is said, may be taken, and two or three boards sawed from the centre of it, thus dividing it into two parts; these parts may then be turned down and sawed into quarters, taking away two or three boards as before; and in like manner the whole is to be cut up. When the stuff is so cut, it is stated that the hoops will bend with greater uniformity than usual, and with scarcely any waste of timber.

We must leave the makers of flat hoops to judge of the originality

of this invention, as we are not sufficiently well acquainted with the history of this art to form a decisive opinion in the premises. All we know about it is, that we have frequently seen hoops made of wood crossing the growth, but they were probably rived, and not sawed, from the surface to the centre.

Specifications of American Patents.

Specification of a patent for an improvement in the process of tanning hides and skins. Granted to Thomas G. Peachy, *city of Williamsburg, state of Virginia, December* 28, 1833.

To all whom it may concern, be it know that I, Thomas G. Peachy, of the city of Williamsburg, in the state of Virginia, have invented an improved mode of procedure in the process of tanning hides and skins by which the time required for that operation is abridged, and the apparatus employed much simplified; and I do hereby declare that the following is a full and exact description of my mode of procedure:—

I form the skins into bags by sewing their edges together, leaving an opening for the introduction of the tanning liquor, which opening is supplied with a nozle, tube, or other contrivance, having in it a stop cock, or valve, and capable of being attached by screwing, or otherwise, to a forcing pump, by means of which the tanning liquid may be injected into the bag, so as to exert any degree of pressure that it is capable of bearing. The liquid thus forced in will ooze through the skin, or hide, to be tanned, the spent liquid evaporating, or dropping, from the outside thereof, whilst a new and saturated portion is constantly supplied from the inside, until the process is finished, which in hides or skins of moderate thickness, may be effected in from twenty-four to forty-eight hours.

Instead of making the skins into bags in the way described, frames may be prepared between which the edges of two skins may be pressed and held firmly together, and the tanning liquid may be forced between them in the manner before described, or the skins may be connected together in any other way that will answer the same end. When the skins of animals are taken off, as they may be, without opening them in the usual way, they may then be made into bags with the utmost facility, and much trouble be thereby saved.

A single forcing pump will answer for any number of skins, as by means of the nozle, or tube, they may be attached and removed at pleasure, and the pressure be thus renewed, whenever it becomes necessary.

I am aware that skins have been made into bags, and confined between frames, in the manner herein described, and that they have been filled and distended by hydrostatic pressure, by means of long tubes, so as to produce effects in some respects analogous to those obtained by me. I do not, therefore, claim to be the inventor of the

application of tanning liquor to the inside of bags formed of one or more skins, this having been heretofore done; all that I claim as my improvement being the employment of a forcing pump instead of hydrostatic pressure made by means of a column of the tanning liquid.

THOMAS B. PEACHY.

Specification of a patent for an improvement in the mode of ceiling ships and other vessels. Granted to ANDREW M. FRINK, *New London, Connecticut, December* 31, 1833.

To all whom it may concern, be it known, that I, Andrew M. Frink, of New London, in the state of Connecticut, have invented an improvement in the mode of ceiling ships and other vessels, by which their strength is greatly increased, without necessarily increasing the quantity of timber used in their construction, and I do hereby declare that the following is a full and exact description thereof:—

The practice heretofore followed in ceiling ships and other vessels has been to allow the ceiling plank to run fore and aft of the vessel; instead of which I attach the ceiling to the timbers diagonally, and use two thicknesses, making them cross each other at such angles as I may deem most convenient; as, for example, at an angle of forty-five degrees, more or less. When used between decks I take care that the planks butt closely to the deck, or other timbers, at each end; as upon their so doing the stiffness or stability which they communicate to the vessel, in a great degree depends.

The parts which should be thus ceiled, will depend upon the nature of the vessel, and the uses to which she is to be put; a vessel may, manifestly, be so ceiled throughout, or only in such parts as may be preferred.

What I claim as my invention, and for which I ask a patent, is the placing of the ceiling plank of vessels diagonally, in the manner, and for the purposes herein described.

ANDREW M. FRINK.

ENGLISH PATENTS.

To CHARLES TERRY *and* WILLIAM PARKER, *merchants, for their invention of improvements in making or refining sugar. Sealed June* 26,1833.

The patentees describe their invention to be, first, in preventing, or diminishing, fermentation in the process of making sugar, and in the process of refining sugar, by the use of what they call ferrocyanic acid for that purpose; and, secondly, in the process of either refining or making sugar, promoting and increasing that effect called crystallization, and producing larger quantities of sugar by the use of sulphuric acid for that purpose.

The patentees further describe their invention as follows:—"We use three solutions, hereinafter described, and called, for the sake of distinction, solution No. 1, solution No. 2, and solution No. 3.

For solution No. 1, take ten ounces avoirdupois of crystallized sulphate of zinc, and dissolve it in three gallons of cold water, then add three ounces measure of sulphuric acid, specific gravity, 1.845. This is sufficient for one ton raw sugar.

"For solution No. 2, take nineteen ounces avoirdupois of best Prussian blue, in powder, and six ounces and a half avoirdupois of unslaked lime, also in powder, and thirteen and one-third pints imperial measure of distilled water. Digest them together at a moderate heat, say 120° of Fahrenheit, in an earthen vessel, gently stirring this mixture with wood until all the blue colour has disappeared. Allow the whole to stand till it is cool, and then filter it. This liquid the patentees call, ferrocyanate of lime; it should be brought by concentration, or dilution, which ever may be requisite, to specific gravity 1.020. When at 60° Fahrenheit, ten pints imperial of this liquid is sufficient for one ton of raw sugar.

Solution No. 3. Take ten ounces, avoirdupois, of crystallized sulphate of zinc, and dissolve it in five gallons of cold water; then add five ounces measure, of sulphuric acid, 1,845; this is sufficient for one ton of green sirops, or molasses, with or without a mixture of sugar, to which, respectively, this solution is to be applied, as hereinafter pointed out.

In pointing out the above quantities of the several solutions with reference to a ton, this mode is adopted for convenience, but if more or less than a ton is to be operated upon, a proportional quantity of each of the solutions required is to be used accordingly.

Mode of application, &c.—One ton of raw sugar is to be mixed with the usual quantity of water; boil it in a wooden or earthen vessel, in preference to metal, and remove the impurities as far as can be effected, as usual, by scumming, blood, or white of eggs being employed in the usual manner for that purpose; then boil this, which is called liquor, and while in a boiling state, add to it the solution No. 1; bring the liquor up to boiling again, and continue this boiling a few minutes, until a peculiar and violent action in the liquid is produced, which will be immediately comprehended on trial, and then immediately throw in three pounds of pulverised chalk, and add the solution No. 2, and then stir and boil the whole for five minutes. The whole may then be filtered, evaporated for crystallization, and completed in the usual manner to produce lumps, or loaves, in moulds; but the patentees prefer, as a better mode, that the white of eggs, or bullocks' blood and animal charcoal, should be used in the usual manner before filtration, after adding, and stirring, and boiling, the solution No. 2, as before pointed out. The green sirops, as they are called, which run from moulds, are to be submitted to the foregoing process, adding to them any proportion of raw sugar; but the solution, No. 3, is in this case, to be used instead of No. 1, in the above specified quantity for every ton of the sirops and sugar so mixed, and five pounds, instead of three, of pulverised chalk are to be used; but solution No. 2 will

be required in the same quantity and manner as before stated. Green sirops, without any addition of raw sugar, may be subjected to this process, but they prefer the addition of sugar, as pointed out above. The green sirops remaining from the crystallization of green sirops, as above mentioned, may also be again subjected to the patent process, in like manner as the green sirops as before described, but beyond this they do not propose to repeat their operations.

With reference to sirop, or cane juice, from which sugar has not been separated, or made, the proportion, or quantity, of saccharine matter, or sugar, which it contains, is first to be ascertained by the saccharometer or other usual means, and then it is to be treated as raw sugar, the proportions of the solutions No. 1 and 2, and of the pulverized chalk, or carbonate of lime, having reference only to the weight of saccharine matter, or sugar, which such sirop, or juice, contains. The patentees apply their process to the working of molasses in the mode above pointed out as to green sirops.

Now, whereas the sulphate of zinc used in the solutions Nos. 1 and 3 is merely to decompose the ferrocyanate of lime; and whereas sulphuric acid has been used in the manufacture of sugar, but at a different period of the process, and for a totally different purpose than hereinbefore described; and whereas carbonate of lime has been used to neutralize the sulphuric acid when so used as last aforesaid, the patentees say they use carbonate of lime, or chalk also for the purpose of neutralizing the sulphuric acid, and for that only; therefore, they do not claim as their invention the use of chalk hereinbefore described, or any other carbonate of lime for the purpose aforesaid, neither do they claim for the use of the exact quantities before described of the solutions, nor do they claim the use of any particular compound of ferrocyanic acid, nor the particular use of the salt called sulphate of zinc, for the final removal of the ferrocyanic acid, since ferrocyanic acid in other states than in combination with lime, and other salts than sulphate of zinc, may be used, though the process described is preferred; but they claim as their invention, first, the use of ferrocyanic acid for preventing or diminishing fermentation in the process of refining sugar, and in the process of making sugar; and, secondly, the use of sulphuric acid in the making and in the refining of sugar, for promoting and increasing that effect called crystallization, and producing larger quantities of sugar. [*Lond Jour.*

Specification of the patent granted to RICHARD BUTLER, *merchant, for improvements in manufacturing obtaining, or producing oil from certain substances; and in extracting, producing, or obtaining gas from the same, or such like substances, or from oil produced therefrom. Dated January* 29, 1833.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said Richard But-

ler, do hereby declare, that the nature of my said invention, and in what manner the same is to be performed, is particularly described and ascertained in, and by, the following description thereof, that is to say—

The substances from which are to be extracted oil and gas, are bituminous schistus, or shale and slate (not including slate coal,) and bituminous sandstone, which substances, when pure, do not usually cake if ignited, or thrown into a good fire; and which, by distillation, or carbonization, as hereinafter described, give an oil and gas free from naphthaline. The process for extracting the oil and gas from the said mineral substances, is this:—The said substances are to be broken into small pieces, taking care to separate therefrom any heterogeneous substance, such as clay or pirites, and put into a retort (such as used in making gas from coal,) so much of these pieces as will fill about half thereof, adding thereto some water which advances the process, but is not essentially necessary. The retort is provided with two apertures, to which are adapted pipes with cocks, so that they may be shut at will. Each of these pipes, at its other extremity, opens into a close vessel, or recipient, placed in a tub, or tank; a second pipe joins the first recipient to a second recipient, and a third pipe joins the second recipient to a third recipient, similar to the apparatus known by the name of Mr. Woolf's apparatus. Thus to each aperture of the retort, there is a distinct set of recipients, both of which sets must be made air tight. The third recipient in one of these sets, is provided with a pipe leading to a gasometer; and the third vessel in the other set, with a pipe fitted to a worm or refrigerator, which opens into a fourth vessel or recipient, from which issues another pipe, connecting at will the last mentioned or fourth recipient with the same gasometer, so that no gas may be lost. I say at will, because the gas obtained in this set of vessels is not as pure as the gas obtained through the second. Several retorts may be so arranged as to work into two main pipes, each of which will be connected by a minor pipe to one of the two apertures with which each retort is provided. By this arrangement, two sets of vessels will serve for each set of retorts; and the cocks will be placed on the main pipes, so as to shut or open these at will.

Under the retort, or set of retorts, in a common furnace, a gentle fire is to be lighted; and, after having shut the cock placed on the pipe of that apparatus, which is not connected with the worm or refrigerator, the other cock remaining open, the operation soon begins. First, a watery vapour issues from the retort; next, a yellow oily vapour, both of which are carried into the several recipients of the apparatus, where they are condensed, the most volatile of the oily particles being carried into the worm. As soon as the oily particles become of a darker colour, and are obtained from the retort, or retorts, unmixed with water, and the means by which the colour is observed, is, by having a piece of glass let into the pipe, leading from the retort; the cock belonging to this apparatus is then to be shut, and the cock belonging to the other apparatus is to be opened, at the same time the fire is to be increased, so as to bring, as soon as possible, the retort,

or retorts to a red heat. In this stage of the process oil is obtained from the retort, or retorts, with a large quantity of gas, which flows into the gasometer, whilst the oil is condensed in the several intermediate recipients.

By this method oils of different density are obtained, those obtained in the worm apparatus being more volatile than those obtained in the other apparatus. This difference should be attended to, as it is desirable not to mix them together. These oils may be designated as *Oil No.* 1, *and Oil No.* 2, the oil No. 1 being the most volatile.

Water may be used in the tanks or tubs in which the recipients are placed for more quickly condensing the products, which is the course generally pursued, although, in general, it be preferable to put some water in the retorts; this is not absolutely necessary, as before observed, but the materials may be dried, and even slightly charred, before they are thrown into the retorts; and, indeed, when the principal object is to obtain gas, they should be carefully dried before putting them into the retorts, and the retorts should immediately be brought to a red heat. In the several vessels within which the oils No. 1 and No. 2 are condensed, the oils are mixed, at the time of coming over, with ammoniacal water, and a small quantity of heterogeneous substances, particularly the oil No. 1, but they quickly separate, and the oil floats upon the surface of this water. With respect to the oil No. 2, when care is observed, it should come over free from water. The oils so produced may be said to be in their rough state, and, subsequently, the most approved methods for purifying oils, may be applied to the purification of these oils, such as working with sulphuric acid, filtration, and distillation.

These oils, in their rough state, (but it is preferable they should first undergo some degree of purification, may be manufactured into gas, by any of the methods, processes, and apparatus, by which other oils are converted into gas. The oils No. 1 and No. 2, in their rough state, are often found entirely free from oxygen; and if obtained by the process described, never contain so much as is contained in the coal tar obtained in the coal gas works, where the coal is thrown into retorts already brought to a red heat. These oils, in their rough state, are further distinguished from coal tar, by their containing no napthaline; moreover, the oil No. 2, offers another characteristic feature, if, after being drawn off and distilled, and if in this latter process, the more volatile, or first, proceeds; say one half of the quantity acted upon be set apart, and the remaining half exposed to a low temperature, there will soon appear in this part of the distilled oil No. 2, small flakes of a white, odourless, and light substance, which is a compound of carbon and hydrogen. The gas (prior to any purification) whether obtained from the oils aforesaid, or directly from the said minerals, is distinguishable from coal gas (also in its unpurified state) by its being free from napthaline. In some instances, when the said materials are found stratified in, or embedded with coal, or otherwise, and may happen to be impregnated with portions of napthaline, the bituminous schistus, or shale and slate, and bituminous sandstone, will not then be in a pure state, and, after trial, should not be used.

It will only be desirable further to add, that the gas (whether produced direct from the above mentioned materials, or from the oils obtained therefrom, as above described) may, and indeed will, in most instances, require purifying before being used, as a means of producing light; and in order to purify the same, it will be necessary, (as is the practice in gas works,) to pass it through water, and if particularly impure, then it will be desirable that such water should contain lime, as is well understood.

Having now described the invention, as communicated to me, it will be evident that the apparatus herein described, for producing the oils and gas from the materials hereinbefore mentioned, form no part of the invention, they being in themselves well known and in use, and the same may be varied without departing from the invention; for what I claim as the invention is, first, the production of oils by distillation, or carbonization, from bituminous schistus, or shale and slate (not including slate coal,) and bituminous sandstone, as above described; and, secondly, in the production of gas for illuminating purposes, from such oils, or direct from the bituminous schistus, or shale and slate, (not including slate coal,) and bituminous sandstone, as above described. [*Rep. Pat. Inv.*

Specification of the patent granted to Joseph Pelletier *and* Jean Adrien Desprez, *for improvements in making, or manufacturing, sulphate of quinine. Dated July 25*, 1833.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said Joseph Pelletier, on behalf of myself, and the said Jean Adrien Desprez, do declare, that the nature of our said invention, and the manner in which the same is to be performed is as follows:—

I will first premise, that the principal object is, the production of sulphate of quinine, by means of distilled or compressed oils, whether derivable from vegetable, animal, or mineral substances, or matter as a substitute for, and without the aid of, alcohol. I will now proceed to detail the mode of producing it. Where distilled oil is intended to be used, the bark having been treated by acids, and having precipitated the quinine and the other dissoluble matters in the acid, by means of lime, in the usual method used in making quinine, the calcarious precipitate is to be dried, and reduced to a fine powder; it is then treated several times, say seven or eight, with the oil intended to be used; and from my experience I have found turpentine oil to answer the best, which is done in appropriate vases, or other fit vessels found best calculated to answer the object. The oil is then to be separated by decantation or filtration. Where expressed oil is used, care must be taken that the lime be first extracted, otherwise a soap of lime, insoluble, would be formed. The precipitate must then be dissolved in an acid, and the rough quinine be precipitated by ammonia; when in this state, it must be treated with oil several times, which will dissolve the quinine, and separate from it all matters

foreign to the same. After obtaining the quinine in dissolution, by expressed or distilled oils, the oil is to be treated by water acidulated with any acid capable of forming a soluble salt with the quinine, (I prefer Hydrochloric acid;) the acidulated water separates the quinine from the oil, the separation being easily effected by decantation, as the two liquids, having different specific weights, will not combine. The quinine thus dissolved, is to be precipitated by an alkali, and after that, it is reduced to sulphate by uniting it to sulphuric acid, care being taken to saturate and whiten by animal charcoal; it is then crystallized by the method usually adopted. There is another mode of separating the quinine when dissolved in distilled oils; this mode is by application of heat in any of the known ways used in the separation of liquids; but the process I consider less advantageous, and I therefore prefer treating the oil by acidulated water.

I claim as our invention, the production of sulphate of quinine, by the use of expressed or distilled oils, without the aid or intervention of, and as a substitute for, alcohol; and I also claim the benefits to be derived or derivable therefrom. [*Ibid.*

The Caloric Engine. By J. Ericsson.

Continued from p. 420, vol. xiii.

"The vessel by which the transfer of the heat is effected, the inventor calls the 'regenerator,' since within this vessel power may be said to be thus far regenerated, that its source, the heat, which in former engines is continually wasted, is by this apparatus preserved, or brought back to perform the same duty over again.

"By the following description it will become evident that the impelling agent or circulating medium, in the caloric engine, may consist of various æriform or fluid substances, capable of considerable dilatation by heat. But atmospheric air will probably be found the best in practice, since in case the apparatus should happen to leak, the loss caused thereby may be so easily replenished by taking any required fresh supply from the atmosphere.

"Previous to describing the action of the engine, let us suppose that the stove, with its pipes, and the working cylinder, have been heated, and likewise the regenerator with its tubes, to be brought to the same temperature nearest to the stove, gradually lessening, so as to be at the opposite end equal in temperature with the surrounding atmosphere."

"It becomes evident that if air be forced or pumped into the caps of the regenerator until it has attained any given pressure, it will, on the one hand find its way through the stove pipes, &c. into the top part of the hot cylinder, on the other hand, through the pipe, into the top part of the cold cylinder; but the hot cylinder being larger (say double the size of the cold cylinder,) it naturally follows that the power of the piston will overcome the power of the smaller piston, and make it ascend, itself at the same time descending. Thus motion will commence, and by reversing the position of the slide

valves when the pistons have performed their full strokes, the motion will be kept up without any further charging.

"The action of the engine, and the transfer of the heat, will at once be understood. The piston of the hot air cylinder being supposed in the descent, it will be seen that the hot air from the lower part of the hot cylinder escapes under the lower slide valve, through the pipe, into the body of the regenerator, and the piston in the cold being on the ascent, it draws the air from the body of the regenerator through the cooler, entering under the lower slide valve of the cold air cylinder, at the same time the air above the piston, in that cylinder, is forced through the tubes, to the stove pipes, into the top part of the hot cylinder. Thus the two cylinders are made to supply each other; but the hot air entering the body of the regenerator, will, by the peculiar arrangement of the division plates, make a very circuitous passage, and by having its particles constantly intermixed, readily give out its heat. The cold air entering the tubes, from the cold air cylinder, will also, during the passage, have its particles rapidly intermixed by the metallic discs, and thereby readily take up the heat given to the tubes by the opposite current, and accordingly become heated.

"The transfer of the heat being thus explained, it need hardly be stated that the object of the stove is, besides that of heating the apparatus at the commencement, to restore that which will unavoidably be lost by radiation, and in the transferring process. And the object of the cooler is that of abstracting any heat from the circulating medium which has not been taken up in the regenerator, that it may enter the cold cylinder at the lowest temperature possible.

"By charging the engine with air of greater density, its power will of course be increased. It is true that by increasing the density in the tubes, &c. the density in the body of the regenerator will also be proportionally increased: *still by keeping the temperature of the air that enters the hot cylinder about* 480° *higher than the air that leaves the cold cylinder, the pressure in the seven pipes will always remain nearly double that of the pressure in the body of the regenerator*,* provided the motion of the slide valves be adjusted in accordance with the principle of the action of the engine. In practice, it will be found quite impossible to preserve the pressure in the engine without a constant supply from without; a pump will therefore always be attached to the engine, constantly charging the pipes of the regenerator: and to prevent overcharge, a safety valve is attached in some convenient place for carrying away the surplus.

"*By keeping the pipes in the regenerator so charged with air as to support a column of mercury* 56 *inches high, the greatest effect is produced in the trial engine. By the manner in which the slide valves are worked, the pressure in the body of the regenerator always adjusts itself, so as to support a column of mercury* 18 *inches high; so that an effective pressure, equal to* 38 *inches of mercury, is kept up. A break, well oiled and loaded, with* 5000*lbs. weight acting on the circumference of a wheel*

* By pressure is here meant the absolute pressure on a vacuum.

of two feet diameter, fixed on the fly wheel shaft, will, at the above pressure, keep the speed of the engine at 55 *revolutions per minute. At this speed,* 176 *cubic feet of heated air, of a mean pressure of* 17 *lbs. to the square inch, are admitted into the working cylinder per minute, thereby exerting a force equal to* 431,970 *lbs. moved through the space of one foot: thus* $\frac{431\cdot970}{33\cdot000}$ = 13 *horses' power are communicated to the main crank of the engine. The estimating this power is, however, of no other use than to give an idea of the amount of friction to which the crank engine is subjected. In the same space of time, or a minute,* 94.6 *cubic feet of cold air, of a mean resistance of* 14 *lbs. to the square inch, are forced, or put into circulation, by the cold cylinder, and equal to a resistance of* 190,575 *lbs. moved through the space of one foot. This amount, divided by* 33,000, *will give* 5.7 *horses' power required to work the cold cylinder —hence the two cranks give and receive the power of upwards of* 18 *horses. By communicating the power of the hot cylinder to the cold cylinder, in a direct manner, the available power, setting friction aside, would be* 431,970 — 190,575 = 241,395 *lbs. moved through the space of one foot. This is equal to* $\frac{241\cdot395}{33\cdot000}$ = 7.3 *horses' power—deducting* 2.3 *horses for friction would leave five horses. On these grounds the trial engine has been estimated at five horses' power.*

"The transferring process has succeeded to such an extent that out of the ten pounds of fuel which the engine consumes per hour, the product of heat from three pounds of fuel only are wasted or carried away by the cooler—this important fact has been ascertained by immersing the cooler in a cistern, containing precisely 1081lbs. of water, and by observing the elevation of temperature after an hour's work of the engine; and the increase of temperature in that time is not quite twenty degrees—one pound's weight of fuel being capable of raising the temperature of 9000 lbs. of water, it follows that the 1081 lbs. contained in the cistern would be raised 8.3 degrees by the combustion of one pound of fuel, and hence that the actual increase of twenty degrees of temperature is effected by the combustion of less than three pounds of fuel. The great discrepancy between the quantity of fuel thus wasted, and that actually consumed by the engine, must be accounted for by the fact, that a considerable extent of radiating surfaces is exposed to the cooling influence of the atmosphere without being surrounded by any imperfect conductors.

"What may be expected from an engine of a large scale, and in which the loss of heat by radiation is carefully guarded against, need not be pointed out."

We have now put our readers in possession of the whole of the pamphlet, and we have printed some of the main points in italics, to which we would more particularly wish to call their attention. If the caloric engine is to stand or fall on the correctness of the pamphlet, it will not require many degrees of foresight to predict the result. The writer states that the air being kept 480° higher in the pipes which pass through the "regenerator," than it is in the cold air cylinder, will always *remain nearly double the pressure* of the air in the body of the "regenerator;" that is, the air which has come from the *hot air cylinder*, and has only just passed through the furnace, is, in

about a second of time, become colder and of less pressure than the same quantity of air which had simultaneously been forced from the *cold air cylinder.* This, we do not hesitate to say, is erroneous; and we would advise the inventor to place a mercurial gauge in the body of the "regenerator," and he will find that we are correct. This gauge would also have another desirable effect: it would indicate the quantity of pressure which is at all times acting at the back of the piston in the hot air cylinder, which it is most material to know, for this reason, the difference of the column in the mercurial guage on the induction pipe, and the column in the guage on the body of the "regenerator," will more correctly show what quantity of expansive force is really actuating the working cylinder. Again, in respect to the 480°; if the air in the apparatus, prior to its being heated, be of equal density with the outer atmosphere, this temperature will nearly double the expansive force of the air so heated, and will raise the column of mercury in the gauge of the induction pipe to about fifty-six inches, or at a pressure of about twenty-eight pounds, on the square inch of a vacuum. This we will suppose to pass into the working or hot air cylinder, to produce the first, or up stroke, of the piston. The slides being then reversed, this quantity of air, whilst at its maximum of heat and pressure, is to be driven from the hot air cylinder into the body of the "regenerator." And here we must ask at what pressure this will be effected? The inventor says, at a pressure of eighteen inches of mercury, which he states will be the pressure existing at all times in the body of the "regenerator." This, to say the least of it, must be most erroneous. A mercurial gauge on the body of the "regenerator," would indicate a column of about thirty inches, even when the air therein was only at the density of the atmosphere. The working of the cold air cylinder would withdraw a quantity of air from the body of the "regenerator," which would be simultaneously replaced by hot air from behind the piston of the hot air cylinder. The heat and pressure of this hot air would be quickly diffused over the whole of the air remaining in the body of the "regenerator," and some of the heat would, as a matter of course, be communicated to the air passing from the cold air cylinder through the seven pipes which pass through the "regenerator" to the furnace, so long as the air passing through those pipes has less heat than that contained in the body of the "regenerator."

We never remember to have seen so many errors contained within so few lines of print—every step we take opens a fresh field for correction. The next point which strikes us with surprise, is the idea of there being a power of thirteen horses communicated to the main shaft of the engine, though the inventor does not take credit to his engine as producing this as an effective power; but after certain deductions, which we shall speak of hereafter, he tells us that the whole effective power is only equal to five horses; thus, according to his own account, losing eight horses' power by friction caused by the working of the various parts of the engine;—this calculation, like the rest, is fallacious. We will, however, bring the figures again before our readers. The inventor states that the engine makes fifty-five

strokes per minute at a mean pressure of seventeen pounds on the square inch; how this mean pressure is obtained we know not, for has not condescended to explain; these seventeen pounds on each square inch of the piston, are equal to 431,970 lbs. raised one foot high, equal to thirteen horses; the author observing, that "*the estimating this power is of no other use than to give an idea of the amount of friction to which a crank engine is subjected.*" But let us see further what is said on the power and the loss of power by this engine. The piston in the cold air cylinder also making fifty-five strokes in the minute, is said to be subject to a mean resistance, or pressure, of fourteen pounds to the square inch, between five and six horses' power to be deducted from the before mentioned thirteen horses' power; a further deduction of two horses' power is also made for friction, bringing down the effective force of the engine to *five horses.* We suspect that if four-fifths more were deducted, the engine would then not be found to perform its calculated work, for there is no mention made of the quantity of resistance at the *back of the piston in the hot air cylinder*, other than the simple observation that the air in the body of the "regenerator" will support eighteen inches of mercury, though by some magical effect the piston in the cold cylinder is said to be worked at a mean resistance of fourteen pounds on the square inch, equal to a column of about twenty-eight inches of mercury; and yet the cold air cylinder is open to the body of the "regenerator."

We will, in conclusion, sum up the principal of our objections to the propositions contained in the pamphlet, though some of our readers will probably think there are other parts equally deserving animadversion. First, the air in the body of the "regenerator" must always be capable of supporting a column of more than thirty inches of mercury, supposing the engine to commence working with air of the same density as the outer atmosphere; the author is wrong in stating it to support only eighteen inches of mercury. Secondly, the hot air, after it has actuated the piston in the hot air cylinder, will, on coming into the body of the "regenerator," impart its heat and pressure to the remaining air, and quickly equalize the pressure in all directions, a very small quantity of heat would be transmitted to the air in its passage from the cold air cylinder to the furnace. Thirdly, the air on being forced from the cold air cylinder, through the pipes to the furnace, will, as it becomes heated, react against the piston of the cold air cylinder. Fourthly, no allowance has been made for the reaction of the air behind the piston in the hot air, or working cylinder, although the air is at its maximum of heat and pressure, and has to be forced through small orifices (technically called wire drawn) into the "regenerator," which is already under considerable pressure, and which must be greater than merely sufficient to support eighteen inches of mercury, or nine pounds on the square inch, as stated in the pamphlet.

And now a few words as to the engine itself. We may be told in answer to what we have said in respect to the pamphlet, that the engine works, and has surprised many who have seen it; perhaps so,

but that does not improve the value of the engine any more than it does the value of the pamphlet. We do not hesitate to say, that the present air engine, like its predecessor, will die without issue, and that the whole power produced is the difference of pressure caused by the air passing directly from the furnace to the working cylinder: the "regenerator" being, in truth, an obstacle rather than an advantage. If, as we before mentioned, a mercurial gauge were placed on the induction pipe, and another gauge on the body of the regenerator, the difference of the columns would be very immaterial, and this, putting the friction out of the question, is the only power obtained. We have said nothing of the practical difficulties of having pipes, or tubes, acted on by fire, which would alone be sufficient, even if the principal of the engine were good, to condemn the "caloric engine;" there is also the working of the hot air cylinder and piston at a dry temperature of 500° of Fahrenheit; but these objections will be evident to every practical man, and need no further observations from us.

[*Rep. Pat. Inv.*

Manufacture of Varnishes. *By* J. Wilson Neil.

[From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.]

As this paper is intended for the information and use of those persons who know little or nothing of varnish making, it has been deemed necessary to give the most ample and plain directions, which, at first sight, may appear superfluous to those who are a little acquainted with the business. But those who are the most competent judges will, I am certain, agree with me that the directions cannot be too plain, ample, or particular; either as relates to the erection of furnaces, choice of pots, and the various other implements required in the trade; and still more particularly in the choice of the various materials of which varnishes are composed; together with the more simple, easy, and economical methods of conducting and performing every operation connected with the business of varnish making.

I advise every practitioner when he commences varnish making, to keep a book, or "*working journal*," and in it to enter the day of the month and year, the quantity and quality of gum used; the quantity of oil, turpentine, and dryers; the number of hours it has boiled, the quantity of varnish produced, in gallons, the number of the cistern where it is stored, and the name which is marked on the outside. Also, and particularly, whether the atmosphere was wet, cold and dry, or very hot and dry, &c., noticing also the *day* upon which it is sent out for use. From these observations the most important information may be acquired.

Hitherto, the art of varnish making has been kept, in its details, as far as possible, a profound secret, and therefore when thrown open to investigation, and assisted by the exertions of men of real chemical research, farther improvements may, no doubt, yet be made. That

the present communication—the result of thirty years of anxious study and practical experience—may conduce to these inquiries, by stimulating the established practitioner, and urging others to the task, is the most fervent hope of the author.

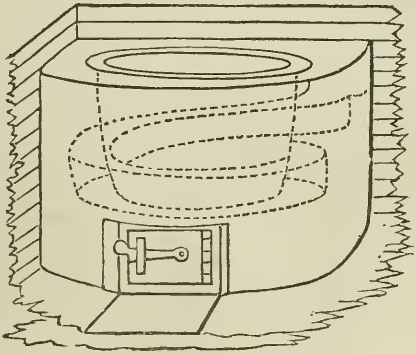
Every person intending to manufacture varnish on a profitable scale, ought to procure suitable premises some distance out of town, and sufficiently large for the scale of business intended. The building, or shed, wherein varnish is made, ought to be quite detached from any other buildings whatever, to avoid accidents by fire. For general purposes, a building about eighteen feet by sixteen, is sufficiently large for manufacturing 4000 gallons and upwards annually, if there are other convenient buildings for the purpose of holding the utensils, and warehousing the necessary stock.

On the fixtures and utensils necessary for manufacturing varnish on a scale of the above extent, I shall give the most plain and ample directions, point out the least expensive method, and afterwards leave every future operator to judge for himself of the number, size, form, and quality of the fixtures and utensils which he may require, according to his intentions and circumstances. Procure a building, or erect one, eighteen feet long by sixteen wide; the back wall eighteen feet long and eighteen high, the front eighteen feet long, and nine high, with a doorway in the centre four feet wide, with folding doors made to lift from off the hinges; let the roof slope to the front: fix also, in each end wall a frame and door four feet wide, and made to lift off the hinges also, so that, when necessary, there may be a free draft through the premises. Let three skylights be made, each four feet long by three feet broad, and fixed in the roof, not directly over the furnaces, but on one side, so as to throw light on the furnaces. Next, have three frames exactly the size of the frames of the skylights, well grooved and battened, with broad flaps to open on the outside, hung at the top with hinges, and capable of being raised by a spring lever and cord inside, as occasion may require. The skylights and flaps must be well secured by lead flushings, to prevent wet getting in, which might be attended with serious consequences.

Supposing the roof and doors all complete, in the left hand corner, against the back wall, dig out a foundation four feet by four, and two feet below the intended level of the floor; level the mould of the foundation, lay a course of brick and mortar all over, taking care that where the ash pit is to be, the bricks are good and well laid; then set out the ash pit. Mark out the circumference of the pot mouth upon the foundation, with nine inches space all round between the walls and circumference of the pot. If the pot be thirty inches diameter at the mouth, begin the ash pit, and raise it four courses of bricks high, and nine inches thick, all round the ash pit, carefully filling up and treading in a solid foundation of earth, clay, or rubbish, level with the ash pit; then lay on a piece of flat iron across the back of the ash pit, and another strong piece in front, two feet two inches from the back, for the wrought iron bars to lie on, which bars are to be one and a half inch broad at top, and two inches broad and flat

at the ends, so that when laid close there will be half an inch space between the bars. The bars to be two feet in length. The ash pit being sixteen inches wide, requires seven bars. When the bars are laid on then set the door frame and door: let the door be one foot wide, by nine inches high. Then build the fire place over the bars three courses high, with good sound Welsh or Stourbridge bricks, levelling and enlarging the fire place on each side as it rises up, leaving a flue eight inches broad by six inches high, slanting upwards to the right. Upon the third course of bricks lay another course of bricks, with their inner and upper edges cut or chipped off, so that the pot can be placed on them in the centre, where it is to be well secured by carrying up the remaining work with common bricks, forming and carrying up the circular brick work, also bringing the flue round in a spiral form, leaving it five inches wide and seven inches high, taking care not to carry the flue too high up the pot sides; for if too high it will be in danger of being overheated some time, when the pot is not near full, and thereby setting fire to the contents. The last, or finishing course of bricks, ought to be laid in composition, with the inner ends under the flanch of the pot mouth, and with the outer ends a little raised upwards. This pot being complete, call it the set pot; (fig. 1;) it is used for the purposes of boiling oil, gold size, japan, and Brunswick black, &c.

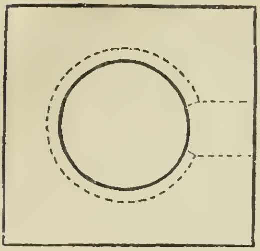
Fig. 1.



Boiling Furnace.

Dig out a foundation facing the front door, against the back wall, four feet by four, and two feet deep; lay one course of brick and mortar, as before; build up an ash pit exactly as before, only leave a distance of one foot between the back end of the ash pit and the wall. When the pit is raised four bricks high, lay on seven bars as before, placing the frame and door in front; then build a circular fireplace of twenty-one inches in diameter, four bricks high, formed with the

Fig. 2.

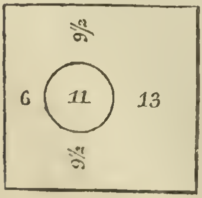


halves, or square ends of Welsh or Stourbridge bricks, well laid and close set: float the surface of the top course well, and have ready the cast iron plate, (see fig. 2,) dimensions thirty-five inches by thirty-five, one inch thick, with a circular hole seventeen inches diameter in the centre of the plate. A flue is to be left at the back of the brick work eight inches wide by six inches high, into the chimney shaft. Finish the ash pit outside the furnace door, with a grating to fit, it then will be complete.

Gum Furnace.

Against the back wall, in the right hand corner, dig out a foundation of three feet by three, and two feet deep; lay a course of brick and mortar; mark out and erect an ash pit, the back of which is to be sixteen inches from the back wall, and nine inches from the end wall. The ash pit is to be sixteen inches in width by twenty-eight in length; raise it five bricks high, carrying up the other part of the brickwork at the same time, thirty inches long by thirty-seven inches in breadth in front; then level all round, and tread in solid; lay a piece of flat iron at the back, and two pieces in front, to receive and rest the bars upon, (seven in number,) the same thickness as the others, only thirteen inches extreme length, including one and a half at each end, made flat to the breadth of two inches: nine inches clear of the brick work lay the bars, and raise a circular fireplace nine inches diameter inside, without any door, or frame, in front, only leaving the ash pit open. Carry up four inch brick work between the fireplace and the front, with Welsh or Stourbridge brick ends, set in loam, round the fireplace; they must be laid close and solid, the outer ends of them well wedged. Above the third course leave a flue at the back eight inches wide and six inches high, to communicate with the chimney shaft. On the third course, above the bars, lay two more courses of brick, rather bevelling, or widening, the furnace at the top.

Fig. 3.

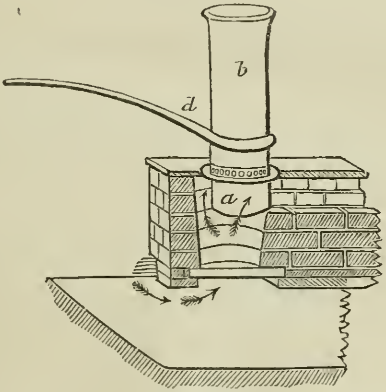


Have ready a plate cast on purpose, three quarters of an inch thick, thirty inches long from back to front, and thirty inches wide, with a circular hole of eleven inches diameter, not in the the centre of the plate, but only six inches from the front end, (see fig. 3.) Finish the perpendicular brick work square with the edges of the plate, lay a movable grating over the ash pit in front, and it is complete. All furnaces require to have slow fires kept in them for a day, in order to dry them slowly, and prevent their cracking.

Gum Pot.

Procure a copper gum pot to fit into the last furnace, No. 3; the dimensions are, two feet nine inches high from bottom to top, nine and a half inches diameter across the bottom, outside. The bottom is hammered out of a solid block of copper, and fashioned all of one piece, exactly like a hat without the brim (see *a*, fig. 4.) The upper part of the pot *b* is made of sheet copper, of a cylindrical form, ten inches diameter at top, and two feet two inches high, about three-eighths of an inch thick; the lower part of the cylinder is then riveted to the bottom with copper rivets, the heads of which are inside, and project through the lappings of the copper, flattened on both sides. Previous to riveting on the bottom, a flanch of copper, of about three-eighths of an inch in thickness, is fixed on to the bottom part, under the large rivets: it is fixed horizontally round the pot. Also, previous to riveting on the bottom, put on the iron hoop *d*, one and a half inches in breadth, to which is welded an iron handle, made one inch broad by one inch thick, gradually increasing to two inches in breadth, but decreasing in thickness. The length from pot to handle end, two feet eight inches.

Fig. 4.

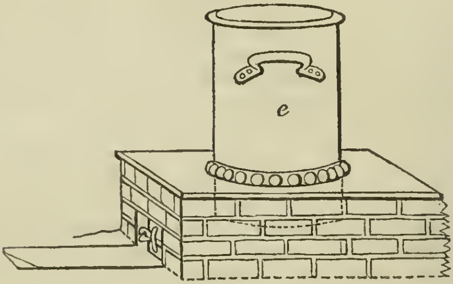


Boiling Pot.

Procure a copper pot *e*, to fit furnace fig. 5, the bottom to be beat out of the solid, as the gum pot, and of the following dimensions:—Diameter across the bottom, outside, twenty inches; height of bottom seven inches; the cylindrical or body part of the pot to be two feet ten inches in depth, and joined to the bottom part with strong copper rivets, made to project through at least three-quarters of an inch, and to be well hammered, inside and out; for, as there is no flanch, the rivets must be large and strong to support the weight of the pot and its contents, while boiling on the furnace place. It ought to fit the

plate neatly, yet so easy as to lift off freely. Seven inches below the mouth of the pot fix on two strong iron handles, one on each side, riveted through each end with two strong rivets; the space for the hands to be seven inches, and one and a half inches in diameter, and to project four inches from the pot sides.

Fig. 5.



Copper Ladles.

Two copper ladles, made to hold two quarts each, with the bowl part beat out of the solid copper, and riveted to a rod of the same metal, three and a half feet long, and three-quarters of an inch diameter, and finished with a turned hardwood handle, seven inches long, and riveted at the end.

Fig. 6.

Two good ladles for the iron set pot, made of sheet copper or sheet iron (cast iron being too heavy,) with good ash handles. For a pot of forty gallons, or upwards, the ladle to hold three quarts. Handle five feet long, tapering towards the hand.

Two copper stirrers, (fig. 6,) made from three-quarter diameter copper rods, three and a half feet long, beat flat at the one end to one and a half inch in breadth, eight inches up the rod; to be finished with ferruled hands, seven inches in length.

One large, strong, well made copper funnel, with lapped seams, for straining boiling varnish, or oil, (tin, or soldered ones, would melt.)

One copper oil-jack, (fig. 7,) which will contain two gallons, for pouring in hot or boiling oil, with a large, strong, pitcher-fashioned handle, and a spout in front.

Fig. 7.

One brass, or copper sieve, containing sixty meshes to the inch, nine inches diameter, for straining the first varnish.

One brass sieve, containing forty meshes to the inch nine inches diameter, for straining gold size, turpentine, varnish, boiled oil, &c.

One brass sieve, forty meshes to the inch, and nine inches diameter, for straining japan and Brunswick black.

One saddle (fig. 8,) which is a sheet of plate iron, or tin, twelve inches broad, and turned up one and a fourth inch at each side: it is to lie from the edge of No. 1 pot, on the edge of the tunnel, to prevent the spilling of the varnish during the time of taking it out.

Fig. 8.

One tin pouring pot, to hold three gallons, made exactly like a garden watering pot, only smaller at the spout, and without any rose: this is never to be used for any purpose except pouring oil of turpentine into the varnish.

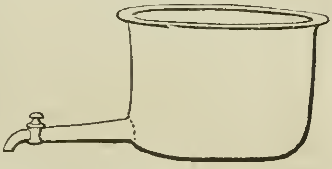
One three gallon tin jack, made with a strong handle at back, and a large broad spout in front: used for receiving the washings, when poured out from the gum pot.

A small broom, termed a swish, made from the waste cuttings of cane tied on a small handle, like a hearth broom, the head five inches long, and five inches round, with handle three feet long: its use is for washing out the gum pot each time it is used; to be always kept clean and left in oil of turpentine.

One iron trevet made with a circular top fourteen inches diameter, with four small cross bars; the three feet of the trevet twelve inches high: it is used for setting the gum pot upon, with its bottom upwards, for a minute between each running.

Directions for Clarifying Oil for Varnish.

Fig. 9.



Procure a copper pan, (fig. 9,) made like a common washing copper, which will contain from fifty to eighty gallons, as occasion may require; when wanted, set it upon the boiling furnace, fig. 5, and fill it up with linseed oil within five inches of the brim. Kindle a fire in the furnace underneath, and manage the fire so that the oil shall gradually, but slowly, increase in heat for the first two hours; then increase the heat to a gentle simmer, and if there is any scum on the surface, skim it off with a copper ladle, and put the skimmings away. Let the oil boil gentle for three hours longer, then introduce, by a little at a time, one quarter of an ounce of the best calcined magnesia for every gallon of oil, occasionally stirring the oil from the bottom. When the magnesia is all in, let the oil boil rather smartly for one hour; it will then be sufficient. Lay a cover over the oil to keep out the dust while the fire is drawn and extinguished by water; then uncover the oil, and leave it till next morning; and then, while it is yet hot, lade it into the carrying jack, or let it out through the pipe and cock: carry it away, and deposit it in either a tin or a leaden cistern, for wooden vessels will not hold it; let it remain to settle for at least three months. The magnesia will absorb all the acid and mucilage from the oil, and fall to the bottom of the cistern, leaving the oil clear, transparent, and fit for use. Re-

collect, when the oil is taken out, not to disturb the bottoms, which are only fit for black paint.

[TO BE CONTINUED.]

Machine for Silvering Looking Glasses. By Mr. GEORGE FARROW.

[From the same.]

The common silvering table for looking glasses is a slab of stone, ground to the most perfect degree of evenness, and placed in a frame so that a certain degree of obliquity can be given to it. All round the margin is a gutter, through which, at one corner, a hole is made, so as to allow the escape of the mercury when the plug that closes the hole is removed. It is this corner which is lowest when the oblique position is given to the table, in order that the mercury may run to it from the other parts of the gutter. On the silvering table is spread a sheet of tin foil of the same size as the glass, or rather a little larger, a fluid amalgam of tin is then poured on it, and spread over its surface with a brush till it adheres; more mercury is then poured on, till it stands about a quarter of an inch deep over the tin foil. The plate of glass, being previously made quite clean, is then slid gently and steadily from a sheet of paper, just dipping below the surface of the mercury, but avoiding to touch the tin foil, for fear of tearing it. When the glass is fairly over the tin-foil, the table is placed a little oblique by means of a rack; the mercury now runs into the gutter, and the glass subsides on the tin-foil. The whole surface of the glass is then covered with leaden seven-pound weights, having cloth at the bottom; by this pressure, at the end of twenty-four hours, the silvering is so firmly adherent to the glass, that the weights may be removed, and the glass raised up in a sloping position, to allow the mercury to drip off, till the silvering has become quite hard.

Mr. Farrow's improvement consists in dispensing with the loose leaden weights, and in producing the required pressure by means of screws. It is attended with the following advantages. First, all hazard of breaking the glass during the application of the pressure is avoided; when loose weights are used, one will sometimes slip out of the hand of the workman and falling on the glass, will break it. Secondly, the plate, as soon as the pressure is made by means of the screws, can be tilted up, even in a vertical position, so as to expedite considerably the drip of the mercury from the silvering—an operation which is manifestly impossible where loose weights are employed.

Mr. Farrow himself has hitherto applied his invention only to small plates for dressing table glasses; but Mr. Wheeler, a manufacturer of looking glass, has applied Mr. Farrow's apparatus, with some modifications, to plates forty-seven inches long, and twenty-nine inches wide.

In the accompanying figures, 1 is a top view of one end of a large stone bed, 2 is a section of the same; *a b*, the stone slab; *c d*, its frame, containing the usual channel for the mercury; *e*, one of the end supports, on which the bed can turn, for the purpose of being tilted;

the middle strengthening bar *f*, which serves for an axis, is placed a very little on one side, to make the side *d*, at which the slope is given, always preponderate, that side usually resting on one or more screws,

Fig. 1.

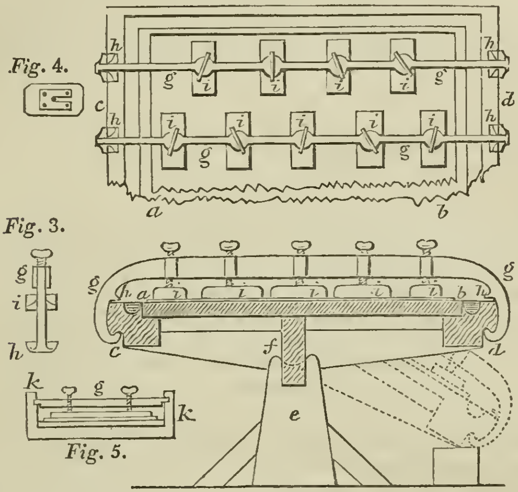


Fig. 2.

by which it is lowered or raised again. The dotted lines in fig. 2 show that side of the bed as lowered, and resting on a block. The upper and under sides of the frame *c d* are made quite parallel, to fit the hooked ends of the long clamps *g g*, which slide from one end to the other. The clamps are furnished with little plates *h h;* these project inwards, for the clamps to stand and slide on when the screws are loosened. They are also, with the under hooks, made sufficiently wide, as shown in the end view fig. 3, to prevent the clamps from falling on one side. A sufficient number of these clamps is provided to range over the bed about one foot apart; and the screw holes in one clamp are made to be opposite the intervals in the next, as shown in fig. 1, in order to distribute the pressure more equally over the surface of the glass. *i i i*, the clamping blocks of wood, faced with leather; they hang on the screws loosely, so as to rise and fall with them, and allow of being placed in any position. Fig. 4, one of these blocks separate; they are about seven inches long, and the screws are eight inches apart. The clamps are usually all drawn to one end of the bed, to be out of the way, and to make room for the glass plates being slid on, and need only be taken off when the largest glass is to be silvered, and then replaced to give the pressure.

Fig. 5 is an end view, or elevation, of a portable bed for silvering small glasses, and is Mr. Farrow's original invention; it has wooden

sides, *k k*, raised above the bed, in which the several wooden clamping bars, *g*, slide. Here two screws only are used to each bar; and the battens that hang on their lower ends are in one piece. This, with the glass on it, is placed by hand in any required position.

The glasses being quite clean for silvering, the faces of the battens, or clamping blocks, *i i i*, never take any dirt whilst in use; and as they always remain pendent, with their faces downwards, when out of use, they keep clean, so that the glasses are not liable to any scratches from them.

¶ *Vehicle for Miniature Painters.*

[From the same.]

The Silver Isis Medal was presented to Mr. J. Hammond Jones, Miniature Painter, for his Fluid intended to be used as a vehicle for colours in miniature painting.

Ivory used to be, and still is, the material on which most miniature paintings are executed; but of late, slabs of fine porcelain biscuit ware have been introduced in its place, as being easier to obtain of large dimensions, and as affording a firmer hold for the colours than ivory does, on account of the great difficulty of freeing that substance entirely from oil.

The pigments used by the painter of miniatures are mixed up with gum water; but as gum is a substance very soluble in water, there is a considerable difficulty in laying a tint cleanly and evenly over another, from the liability of the gum contained in the first tint to soften on the application of the second, and thus produce a muddy colour intermediate between the two. If the artist, also, happens to be short sighted, he is obliged to bring his face very near his work, and then the moisture of the breath will scarcely allow the tints that are mixed up with gum water to dry.

The liquid vehicle that Mr. Jones employs for his colours is a cold saturated solution of borax in distilled water, in every quart of which is afterwards dissolved a quarter of an ounce of gum tragacanth.

The ivory or porcelain plate is first to be covered with two or three layers of the liquor, allowing sufficient time for one layer to dry before the next is added; and then the colours are laid on, each being mixed to a proper consistence with a few drops of the liquid.

The above mentioned vehicle renders whatever colour it may be united with so hard and firm, when dry, that tints may be laid or washed over each other with the same ease as tints of water colours on paper; and thus the artist is enabled to work in his draperies and back grounds with more boldness, facility, and expedition.

¶ *New Apportionment of the Globe for representation in Maps.*

Sir,—It has long ago been remarked by me, what little variety was to be found in atlasses, with regard to the representation of large

portions of the sphere. A pair of hemispheres on the plane of a meridian (20° W. long.,) and a map according to Mercator's development, constitute in general the whole, though sometimes a pair of equatorial hemispheres is added. The projections are either stereographic, or globular:* in modern times the latter, without any good reason, has prevailed. In fact, the globular meridianal projection is become so common, that its faults are softened down by familiarity, and it is only when we view the equatorial delineation upon the same principles that the great distortion near the borders is perceived; and yet the only difference between the two cases is, that the distortions are in contrary directions.

Lately, the Society for the Diffusion of Useful Knowledge published maps of the Celestial Sphere, referred to the six sides of a cube, by what is called the Gnomonic projection; and, more recently, a similar set for the terrestrial globe. The former are liable to many objections, but the latter are excessively awkward and inconvenient. Europe, Asia, and North America are cut asunder in the midst, and there being no overlapping portions, the connexion of those parts which we wish to view in entirety is wholly interrupted.

The contemplation of these last mentioned maps, induced me to consider whether some better method could not be divised, of representing the whole world in convenient sections, and at the same time avoiding the too great distortion or expansion of scale which occurs in hemispheres. And it appeared to me, that the globe might be projected in four equal portions, on the faces of an equilateral pyramid. This, however, would produce nothing but triangular maps, which would look badly enough; the next step, therefore, was, to extend the limits of each plane of projection to a circle circumscribing the triangle, whereby each map would represent a *third* instead of a fourth of the spherical surface, and an overlapping of the several portions, to a moderate extent, would take place, and be highly advantageous.†

Having pursued this idea into all its details, with reference both to terrestrial and celestial maps, the result is so satisfactory to my mind, as to induce me to submit it to the consideration of the public.

I propose to make the *North Pole* correspond to the apex of the pyramid; of course the *South* will touch the base of the solid at its centre. The middle latitude (or declination,) of each of the other three planes will be 19½° N.;‡ and the pole being at the upper point of the circumference, the greatest south latitude will be 51° nearly. The longitude of these centres will of course differ by 120°, but their

* It should be rather called *pseudo*-globular. For the *equal* division of the central meridian, and the longitudinal and latitudinal *circular* arcs, do not constitute a true projection. A point of view may indeed be taken, which will make the divisions of the radius *nearly* equal, but then the meridians and parallels become all *elliptical*. The stereographic projection does not, strictly speaking, distort the superficial representation: an expansion of scale takes place, which is equal in every direction; but in the globular there is a real distortion.

† The overlapping portions will be six, each equal to one-eighteenth of the sphere, and of a lenticular form.

‡ More accurately 19° 28′ 16″.

relation to the first meridian is arbitrary. The projection will be the stereographic, the principal objection to which, as applied to hemispheres, will disappear, since the radius of each circle will be $70\frac{7}{8}°$, instead of 90°, and the variation of scale be only from one to one and a half, instead of from one to two.*

All that I have stated thus far concerns equally celestial and terrestrial maps.

For the terrestrial, I propose the three central longitudes to be 60° E., 60° W., and 180° from the meridian of Greenwich. From these data results the following distribution of the continents:—

Section 1, comprises all Europe, Africa and Asia (except part of Siberia, east of Ocholsk.) It includes the Indian islands as far as Gilolo, and also embraces Iceland and the east coast of Greenland, beyond 69° N.

Section 2 comprises the whole of America, (except the Russian settlements;) also western Africa and Europe. It furnishes a representation of the North Atlantic Ocean, very superior to any commonly found in atlasses.

Section 3 comprises the North Pacific ocean, and so much of the south as comes within the modern description of Polynesia, with New Zealand, New Holland, and the Indian Archipelago (except Sumatra and Java.) The western part of North America, and the eastern part of the Asiatic continent, are also within its confines.

Section 4. The southern circumpolar map, containing scarcely any thing but an expanse of ocean. The portions of Africa, South America, and Australia, which fall within it are almost entirely included in the overlapping portions of the other sections, so that this map might easily be dispensed with.

For celestial maps, with a view to compromise as much as possible entire constellations, I place the three central points in RA. 90°, 210°, 330°, whereby we have the following arrangement, naming each section after the constellation in which the centre falls:—

1. Section of Orion. Camelopardalus, *Lynx*, *Auriga*, *Perseus*, Triangulum, Aries, Taurus, Gemini, Cancer, *Eridanus*, Orion, Minoceros, Canis Minor, *Hydræ corpus*, Lepus, Columba, Canis Major.

2. Section of Bootes. Ursa Minor, Draco, Ursa Major, Leo Minor, Canis Venatici, Coma Berenicis, *Bootes*, Corona Borealis, Hercules, Serpens, Serpentarius, Leo, Virgo, *Libra*, Scorpio, Saxtans, Crater, Corvus, Hydræ cauda.

3. Section of Pegasus. Cepheus, Casciopea, Lyra, *Cygnus*, *Lacerta*, *Andromeda*, Pegasus, Vulpecula, Sagitta, Delphinus, Aquila et Antinous, Equuleus, Scutum Sobieski, Sagittarius, *Capricornus*, Aquarius, Pisces, Piscis Australis, Cetus.†

4. Southern circumpolar Section. This includes only stars which either do not rise at all to Great Britain, or whose meridianal altitude is under 20°. In fact, the whole that come under the latter description are comprehended in the overlapping portions of the

* The scales at any two points of a stereographic map are in the ratio of the square semi-secants of the respective distances from the centre.

† The constellations in italics are *divided* in the Society's maps.

other three sections, except three small and very unimportant triangular spaces.

The kind of celestial maps here described correspond substantially with those I have recommended for students in your volume xviii. p. 81; but I did not at that time contemplate giving them a circular form, or placing the centre of projection out of the equator. Both these changes I consider improvements.

I should like much to see published a set of maps both celestial and terrestrial, upon the same scale as those published by the Diffusion Society. The clear diameter of each map would be 14.14 inches (equal to the diagonal of the square maps,) and I think they would answer best if each set were engraved on a single plate.

I subjoin a table of the central distances and radii of curvature for the meridians and parallels of the map, whereby the delineation is rendered as easy as that of a common hemisphere—observing that the centres of the meridianal arcs are in a line at right angles to the principal meridians—and distant 3.536 from the centre of the projection. I have given, also the computed half extents of longitude on the several parallels of latitude. If the limits be delineated, according to the last mentioned numbers, on a Mercator's map, they will present a curve resembling a parabola, having for asymptotes two meridians 180° distant.

PARALLELS.

Lat.	Dist.	Radii.
90	7.07	
85	6.44	0.66
80	5.84	1.32
75	5.26	1.99
70	4.72	2.69
65	4.20	3.41
60	3.69	4.17
55	3.20	4.98
50	2.73	5.85
45	2.27	6.80
40	1.81	7.85
35	1.36	9.03
30	0.92	10.39
25	0.48	11.99
20	0.05	13.92
15	0.39	16.31
10	0.83	19.42
N. 5	1.27	23.19
Equat.	1.71	30.00
S. 5	2.17	40.48
10	2.63	61.70
S. 15	3.10	129.76
20	3.59	
25	4.09	101.42
30	4.60	51.94
35	5.15	34.09
40	5.71	24.75
45	6.30	18.91
50	6.93	14.85

Lat.	Extent. Long.	
70	86°	26′
60	84	34
50	82	36
40	80	31
30	78	13
20	75	40
N. 10	72	44
Equat.	69	18
S. 10	65	5
20	59	40
30	52	14
40	40	42
50	13	45

MERIDIANS.

	Dist.	Radii.
90	10.61	10.61
85	9.72	10.65
80	8.90	10.77
75	8.14	10.98
70	7.43	11.29
65	6.76	11.70
60	6.12	12.25
55	5.52	12.95
50	4.95	13.85
45	4.39	15.00
40	3.86	16.50
35	3.34	18.49
30	2.84	21.21
25	2.35	25.10
20	1.87	31.01
15	1.40	40.98
10	0.93	61.08
5	0.46	121.70
0	0.00	infin.

Lewes, Nov. 21, 1833. J. W. Woollgar.

 [*Mech. Mag.*

CANALS IN THE STATE OF NEW YORK.

STATE CANALS.

Canal Eras.

Erie Canal, commenced July 4th, 1817.
First navigated from Utica to Rome, fifteen miles, October 23, 1819.
Tolls first received July 1, 1820.
280 miles of canal completed, and first boat entered the Hudson at Albany, from the north and west through the canal, October 8, 1823.
Erie Canal completed October, 1825.
Champlain Canal commenced October, 1817; navigable November 1819.
Grand Canal Celebration at New York city, November 4, 1825.
Oswego Canal commenced, 1826. Completed 1828.
Cayuga and Seneca Canal commenced 1827. Completed, 1829.
Chemung Canal commenced 1830. Completed 1833.
Crooked Lake Canal commenced 1830. Completed 1833.

Description of the Canals.

ERIE CANAL.

Length from Lake Erie to the Hudson River, 363 miles, viz.—

Western section—Buffalo to Montezuma, on Seneca River,	157 miles;	21 locks;	fall 186 ft.
Middle do.—Montezuma to Utica,	96	11 rise & fall	95
Eastern do.—Utica to Albany,	110	52 fall	417
Total . .	363	84 rise & fall	698

Lake Erie is 565 feet above the Hudson river at Albany.
The canal is 40 feet wide on the surface, and four feet deep.

CHAMPLAIN CANAL.

This canal commences at the junction with the Erie canal, nine miles north of Albany, and terminates at Whitehall, in the county of Washington, connecting the waters of the Erie canal and the Hudson river with Lake Champlain. It has a lateral cut connecting it with the Hudson River by three locks at Waterford, eleven miles north of Albany, as the Erie Canal has connecting it with the same river at West Troy, by two locks.

Length from Lake Champlain, at Whitehall, to junction with Erie Canal, nine miles above Albany, sixty-three miles. Number of locks, as follows:—

7	locks rise from the lake to the summit level,	54 feet.
14	do. fall from the summit level to the Hudson,	134
Total, 21 locks.	Rise and fall,	188

OSWEGO CANAL.

Length from Salina to Oswego, thirty-eight miles; connecting Lake Ontario with the Erie Canal. One half the distance is canal, and one half slack water, or river navigation, with a towing path on the bank. Fourteen locks, (thirteen of stone, and one of wood and stone.) Descent from Salina to Lake Ontario, 123 feet.

CAYUGA AND SENECA CANAL.

Commences at the Erie Canal at Montezuma, Cayuga county, and terminates at Geneva, Ontario county, connecting the waters of the Erie Canal with those of Seneca Lake. This canal has also a lateral branch to East Cayuga village, on the Cayuga Lake, thus connecting with the waters of that lake. It opens a lake navigation of more than 100 miles.

Length twenty miles and forty-four chains, from Geneva, on the Seneca Lake, to Montezuma on the Erie Canal. One half canal, and one half slack water navigation. 2,710 feet of tow-path bridges. Eleven wood locks. Descent 73½ feet from Seneca Lake to the Erie Canal at Montezuma.

CHEMUNG CANAL.

Extends from the head waters of the Seneca Lake to the Chemung (or Uioga) River, a branch of the Susquehannah, at the village of Elmira, Tioga county. Length 22½ miles, with a navigable feeder from Painted Post, Stuben county, on the Chemung River, to the summit level, 13½ miles, making thirty-six miles of canal navigation. This canal thus forms part of a chain of communication from the Erie Canal to the Susquehannah River. It has fifty-two wood locks, comprising 516 feet of lockage, and one guard lock, three aqueducts, five culverts, and seventy-six bridges. Distance from Elmira to Albany, via. this canal, Seneca Lake, Cayuga and Seneca and Erie Canals, 326 miles.

CROOKED LAKE CANAL.

Extends from Penn Yan to Dresden, both in Yates county, connecting the waters of the Crooked and Seneca Lakes, through a beautiful and fertile country. It is eight miles in length, and has 260 feet of lockage, which is overcome by twenty-seven wood locks. The other structures are one guard lock, twelve bridges, three culverts, and one waste wier.

CHENANGO CANAL.

An act of the legislature was passed, February, 1833, authorising the construction of the Chenango Canal, to extend from the Erie Canal in Oneida county, to the Susquehannah River at Binghamton, Broome county. Length about ninety-five miles. Route as follows: Commencing at Whitesborough, or Utica, passing through the valleys of the Oriskany and Sawquoit Creeks, and Chenango River, and by the towns and villages of New Hartford, Clinton, Madison, Hamilton, Sherburne, Norwich, Oxford, Greene, and Chenango Forkes, and ter-

minating at Binghamton, where it unites with the Susquehannah River

Elevation from the Erie Canal to the summit level,	706 feet.
Descent from thence to the Susquehannah River,	303
Total lockage, . .	1,000

The estimated cost of this canal by Mr. Hutchinson, Civil Engineer, in 1828, was $944,775 36; but the Canal Commissioners, in their report of January, 1834, estimate the cost at $1,737,703 22.

During the season of 1833, surveys of different routes were made from Sherburne, a few miles south of the summit level, north to the Erie Canal, and a preference given to the route terminating at Whitesborough. (The legislature, at their present session, have decided to change it to Utica.) On this part of the canal there will be eighty-seven locks and four aqueducts; and it is proposed to construct the locks with wooden chambers, supported by a dry wall of stone masonry on the sides, excepting about eight feet below the upper gates. Some of the locks are to be of stone. The plan adopted for making this canal, and its different structures, will increase its aggregate cost beyond the sum for which a canal less substantial might have been constructed; but it is the opinion of the Canal Commissioners that it will prove the cheapest and most useful, requiring less expense for repairs. To supply the summit level with water, artificial reservoirs are to be constructed, and fed from ponds and brooks.

Contracts for the thirty-eight miles between the Erie Canal and the village of Sherburne (excepting the reservoirs and feeders,) have been made, and the 15th of October, 1836, is the time stipulated for the completion of the work. Surveys have been made from Sherburne to Greene, Chenango county, and the present season the surveys from Greene to Binghamton will be completed. These sections will be placed under contract as soon as convenient after the completion of the surveys and estimates.

One million of dollars have been appropriated to the construction of this canal, and an additional million is recommended by the Commissioners in anticipation of contracts.

Summary of Canals Completed.

	Length.	Cost.	Tolls, 1833.
Erie Canal	363 miles	9,027,456 05	1,290,136 20
Champlain do.	63 do.	1,179,871 75	132,559 02
Oswego do.	38 do.	565,437 35	22,950 47
Cayuga and Seneca do.	20 do.	236,804 74	17,174 69
Chemung do. and feeder	36 do.	342,133 95	694 00
Crooked Lake Canal	8 do.	136,331 95	200 84
		$11,488,035 99	1,463,715 22
Navigable feeders on Erie, Champlain, and Cayuga, and Seneca Canals.	11 do.		
Total, and owned by the State.	539 miles of canal navigation, completed		

Average cost per mile $21,314.

CONTEMPLATED CANALS.

Genesee and Allegheny Canal.

Public attention has been frequently called to the subject of a canal proposed to be made from Rochester on the Erie canal, to Olean (or Hamilton) on the Allegheny River; and a bill has been introduced into the legislature directing a particular survey of the route, and estimate of the cost of construction. The route was superficially surveyed in 1825, by an engineer of the State, and in 1826 a report made to the legislature by the Canal Commissioners. The canal is to commence at Rochester, following the valley of the Genesee River, through Monroe, Livingston, and Allegheny counties, until it reaches the Upper Genesee Falls, at Nunda, in the latter county, from whence it rises to the summit level 981 feet above the Erie Canal. The length of the summit will be eight miles, and the whole fall, from thence to Olean, Cattaraugus county, on the Allegheny River, is seventy-eight feet. Whole lockage, ascending and descending, 1,059 feet. The length of canal from Rochester to Olean, will vary little from 100 miles. The lockage is equal to 132 eight feet locks on the whole line; being about the same proportion of lockage as the Chenango Canal. A passage from the Ohio valley to the Genesee valley is here 1488 feet above tide level, and is less elevated than any passage that has been examined, either to the Potomac or the Susquehannah valleys. With regard to a supply of water for the summit level, it is remarked by the engineer that the whole of the Ischua Creek can be received into a summit pond; besides, the drainage of 190 miles of surface can be turned into it, so that the reservoir would be abundantly supplied with water. Mr. Roberts, engineer, gives the following account of the capacity of the streams in October, 1825.

Ischua Creek, cubic feet per minute, . .	750
Lime Lake, Beaver Lake, and Peacock Lake, . .	400
Oil Creek, ...	450
Together, per minute,	1,600

In the report referred to, the estimated cost of the proposed canal is 875,588 dollars.

The distance of Rochester from Albany by the Erie Canal, is 270 miles; from thence to Olean, by the proposed canal, say ninety miles; from Olean to Pittsburgh, by the Allegheny River, (which has been navigated by steam-boats,) 260 miles.

"A canal, (says Mr. Roberts,) uniting with the Allegheny River, would accommodate a large section of our country, whose surplus products are equal in quantity and quality to those of any portion of the state, in proportion to its cultivated land and population, in both which respects it is rapidly increasing. Other considerations are, the great enhancement in the value of lands, which are known to abound in lumber of the best quality, and coal mines, and other minerals, on the various branches of the Allegheny, and the very extensive commerce which would be drawn through this canal, and down the

Allegheny and Ohio, and from the countries adjacent. With all these advantages, the canal would undoubtedly soon become a source of increasing revenue to this state."

The following statement of tolls collected on the western part of the Erie Canal, being ninety-three miles, or about the same length as the proposed canal, will form some data to calculate the probable income of the latter. If the proposed improvement should cost 1,000,000 dollars, the interest thereon. at five per cent. would be but 50,000 dollars.

Statement of Tolls collected on the Erie Canal at Rochester, and other places west of the Genesee River, in 1832 *and* 1833.

	1832.	1833.
Rochester	154,541 08	168,452 37
Brockport	13,025 81	18,554 55
Albion	10,219 43	15,178 84
Lockport	28,434 22	50,562 39
Buffalo	58,232 09	03,812 79
	$264,452 63	$326,560 94

A meeting of citizens in the State of New York, favourable to the Genesee and Allegheny Canal, was held in October, 1833, at the Shakspeare Hotel, Christian Bergh, Chairman, Edwin Williams, Secretary; when resolutions were adopted expressive of the opinion of the meeting as to the importance of the proposed canal. A committee of forty-five gentlemen was appointed to call the attention of the citizens generally to the subject. Under the direction of the committee, an interesting pamphlet was prepared and printed, entitled "An appeal to the people of the State of New York, and their representatives in the legislature, in favour of constructing the Genesee and Allegheny Canal.

Black River Canal.

The Canal Commissioners report, March, 1831, that the cost of the proposed canal from Rome to the High Falls of the Black River, a distance of thirty-six miles, and including a navigable feeder of nine miles, at Boonville, with the improvement of forty miles of the river navigation from the High Falls to Carthage, is estimated at 602,544 dollars.

The whole rise and fall from Rome to the Black River, is . . . 1,078 feet.

Length of canal and river navigation, . 76 miles.

The supply of water is to be obtained from the Black River, which, at Smith's mills, is estimated to afford 20,000 cubic feet per minute, in ordinary dry seasons. (See Incorporated Canal Companies.)

[*N. Y. Annual Reg. for* 1834.

CELESTIAL PHENOMENA, FOR AUGUST, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.	Sec.	
8	16			♀ ☌ β Virginis ♀ 2′ North.
11	13	13		♂ ☌ ♃ ♂ 7′ North.
18	8			♄ ☌ γ′ Virginis ♄ 34′ South.
22	6	10		☿ Greatest elongation W.
27	6	49		♃ ☌ ☽ ♃ 23′ North.
27	22	57		♂ ☌ ☽ ♂ 3′ North.
31	10		15.1	♀ ☌ α Virginis ♀ 1°.4′ North.
2	12	30	01.0	Im. ♃'s 3 Sat.
2	14	42	25.8	Em. " 3 "
4	13	21	56.1	Im. " 2 "
4	15	38	14.4	Em. " 2 "
4	16	36	39.0	Im. " 1 "
6	11	4	42.3	Im. " 1 "
9	16	29	28.3	Im. " 3 "
11	15	58	12.6	Im. " 2 "
13	12	58	43.4	Im. " 1 "
20	14	51	11.9	Im. " 1 "
27	16	45	41.7	Im. " 1 "
29	10	31	32.9	Im. " 2 "
29	11	13	40.4	Im. " 1 "
29	12	49		Em. " 2 "
1	14	9		Im. 11 Geminorum ,7, N168° V112°
1	14	31		Em. 216° 168°
11	10	51		Im. 32 ζ′ Libræ ,6, 104° 151°
11	11	44		Em. 226° 277°
12	8	13		Im. (39) Scorpii ,7, 133° 160°
12	8	53		Em. 197° 226°
17	10	27		Im. 25 χ′ Capricorni ,5,6, 90° 80°
17	11	49		Em. 310° 319°
17	15	54		N. App. ☽ and 28 φ Capricorni ,6, ☽ N0.′3
19	11	27		Im. 71 τ^2 Aquarii ,5,6, 91° 73°
19	12	44		Em. 325° 325°
27	14	1		Im. ο Tauri ,4,5, 138° 81°
27	15	8		Em. 266° 212°

Crucible Furnace for Fusion.

Persons who wish to melt or assay steel are not aware how easy it is to obtain a melted mass of one or two ounces, in the space of twenty minutes, without the least difficulty, by means of the following arrangement.

Make a hole in the bottom of a Hessian crucible holding two or

three quarts,—put inside of this crucible the cover of a smaller crucible so that it may rest at about three-fourths of the depth. Make with a file several notches around this cover to admit the air freely, having the knob of the cover uppermost. On this knob place a little crucible containing the metal, which must be covered,—put some lighted charcoal around it, and fill up with coke, (or anthracite coal?) so as to entirely cover the interior crucible. Connect this apparatus with a blacksmith's, or other, bellows, and keep up a constant blast, supplying the waste coal as it is consumed,—in the course of the time mentioned, the steel will be melted. Other metals, even some that are reputed infusible, will yield in like manner. This simple and cheap apparatus abridges time and labour surprisingly, and effects what with the common and costly furnaces would be impossible.—*Silliman's Jour., quoting Jour. de Con. Usuelles.*

Meteorological Observations for April, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	49°	67°	29 50	29.50	W. S.	Moderate.		Lightly cloudy—clear.
	2	44	65	.66	.70	W. E.	do.		Clear day.
	3	48	68	.86	.86	E.	do.		Lightly cloudy—clear.
	4	49	72	30.05	30.05	NE. N.	do.		Clear day.
	5	49	47	29.90	29.80	E.	do.	3.20	Rain in night: thund. & lightning.
	6	48	66	.80	.70	W.	do.		Lightly cloudy—flying clouds.
⊗	7	54	70	.70	.50	SE.W.	do.	0.08	Rain—flying clouds.
	8	49	61	.55	.55	SW.	do.		Clear—cloudy.
	9	46	70	.80	.80	W.	Calm..		Clear—cloudy—rain.
	10	48	62	.74	.74	W.	Blustering	0.35	Flying clouds—rain.
	11	44	73	.84	.60	SW.	do.		Clear day.
	12	50	60	.50	.50	NW.	do.		Clear—flying clouds.
	13	38	52	.75	.80	NW.	do.		Clear—flying clouds.
	14	33	56	.95	.85	W.	do.		Frost—lightly cloudy—clear.
☾	15	22	48	.95	30.00	W.	Moderate.		Frost—clear.
	16	31	58	30.15	.15	W.	do.		Clear day.
	17	40	70	.15	.20	W.	do.		Clear—flying clouds.
	18	50	76	.74	.74	S.	do.		Clear day.
	19	49	84	.64	.05	SW.	do.		Hazy.
	20	69	85	29.95	29.95	N.	Calm.		Hazy.
	21	58	86	.95	.95	SE.	do.		Hazy.
☉	22	52	83	.95	30.00	W.	Breeze.		Fog—lightly cloudy—hazy.
	23	53	85	30.00	29.95	SW.	do.		Fog—hazy.
	24	62	86	29.90	.80	SW.	do.		Clear day.
	25	60	84	.80	.75	SW.	do.		Cloudy—clear.
	26	66	79	.75	.75	S.	do.		Cloudy day.
	27	60	76	.75	.70	SE.	do.		Cloudy—clear.
	28	58	59	.70	.66	E.	do.		Rain—drizzle.
	29	50	57	.63	.60	E.	do.	0.37	Rain—drizzle.
☽	30	50	71	.70	.80	SE.	do.		Cloudy day.
	31	56	76	.86	.86	E.	Calm.	0.35	Cloudy—rain in the night.
	Mean	49.71	69.42	29.87	29.83			4.35	

Thermometer.			Barometer.
Maximum height during the month,		86. on 21st, 24th.	30.74 on 18th.
Minimum	do. .	28. on 15th.	29.50 on 1st, 7th, 12th.
Mean	do. .	59.56 .	29.85

JOURNAL

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AMERICAN AND OTHER PATENTED INVENTIONS.

AUGUST, 1834.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

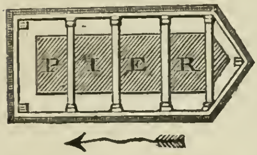
Description of the Viaduct near Peters' Island. By JOHN C. TRAUTWINE, *Architect and Engineer, Philadelphia.*

THE SITE.

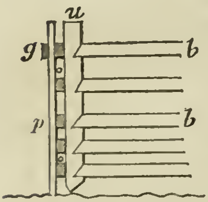
This extensive structure, upon which the Columbia and Philadelphia rail-road crosses the river Schuylkill, is situated three miles above the latter city, at the property of the late Judge Peters, on the western, and that of Isaac C. Jones, Esq. on the eastern side. At the site of the bridge, and for some distance above it, the stream preserves an average width of 850 feet, but widens considerably immediately below it. The western shore rises very gradually from the water's edge for about 150 yards, until it arrives at the foot of the high elevation which forms that slope of the river valley, and which the rail-road overcomes by means of an inclined plane, and a stationary engine of sixty horse power. On that side, the depth of water under the bridge is only four or five feet, but it increases gradually to within twenty yards of the opposite shore, where it is twenty-two feet. From this latter point the bottom rises very abruptly into the high and precipitous rocky bluff of the eastern slope of the valley. The bed of the river is a soft black mud, overlaying the solid rock to a depth of from four to ten feet.

COFFER-DAMS AND MASONRY.

The bridge consists of seven arches, six piers, and two abutments. Five of the arches span 138 feet each; and the remaining two 125 feet each, making with the piers, which are thirteen feet broad on top, a total of one thousand and eighteen feet in the clear between the abutments. All the masonry is founded on the solid rock, with the exception of the western abutment and the western pier, both of which stand on dry land, and rest on a firm natural gravel. The founding of the water piers, and of the eastern abutment, whose face extends a little distance into the stream, was effected by means of coffer-dams, of a very simple construction, suited to their situation in *slack water.* They were framed one at a time on Peters' Island, (which is a small spot in the middle of the river, about one-eighth of a mile above the bridge,) and after being launched, and towed to their proper position, were well moored, and finally sunk by placing large stones on a temporary platform made for the purpose. The strains caused by the uneven bearings on the rock were in no case sufficient either to rupture the frames, or even to throw them so far out of line as to create much difficulty in driving the piles. Their entire length, including an up-stream salient angle, was about eighty feet; their breadth thirty-four feet.



They were composed of a single row of uprights u, one being placed at each of the five angles, and others at intervals of fifteen feet, along both sides, but none at the ends.



Transverse beams, b, about thirty feet long, extending from side to side, were notched into the uprights, and secured to them by iron dogs.

In order to resist the increased pressure of the water towards the bottom, the vertical distances between these beams decreased gradually from three feet near the surface, to eighteen inches at the rock; they were removed as the piers were built up, and their places supplied by short struts abutting against the masonry.

Outside of the uprights, and in number corresponding to the transverse timbers, were spiked rows of horizontal beams, o o, &c., surrounding the whole dam: over these, the sheeting piles, p, of three inch pine and hemlock plank, were driven, until their feet rested on the rock, and their heads remained about eighteen inches above high water mark. This operation was performed with perfect ease, the softness of the mud rendering necessary no other instrument than a heavy wooden mallet worked by two men.

The pile-planks were properly directed in their descent by a horizontal leading beam, g, at the top of the frame, and were kept close together at their feet by the usual method of sloping one end, thus—

With these precautions they drove kindly, and but little trouble was afterwards experienced from leakage. Gravel was thrown in around the dam, and permitted to form its natural slope, until it reached to within one or two feet of the surface of the water.

Slight as the construction of these dams appeared, the result proved that they were all sufficiently strong for the purpose, except that of the eastern pier, which, being unable to resist the pressure of a twenty-two feet head, (or if we include the semi-fluid mud, one of a twenty-eight feet,) failed in consequence, and was afterwards repaired with additional precautions.

As each coffer-dam was sunk, the water was taken out by six or eight common pumps, worked by a steam engine of six horse power, floated on a scow; and the rock, after being cleared of the mud (which was raised in buckets, partly by windlass, and partly by handing it up successive stages,) was properly levelled and stepped off for receiving the foundations of the piers.

The piers at high water mark are sixty feet long, exclusive of the triangular pier-heads, or starlings, and batter both below and above water at three-fourths of an inch to a foot, as high as the skew-back, from which spring the curved ribs of the superstructure. From the skew-back they rise vertically to the level of the chord pieces C, which rest on them. Their height above water is thirty-five feet, and their breadth at high water twenty feet. The abutments are thirteen feet thick at their base, and batter externally three-fourths of an inch to a foot, that their faces may accord with those of the piers; internally they are vertical. The western wings form circular segments to a radius of fifty feet, their chord being seventy-nine feet. They are nine feet thick at the face of the abutments, and six feet at their extremities; they finish off by two flights of steps twenty-four feet high; like the abutments they batter three-fourths of an inch to a foot outside, and are vertical inside; they are surmounted by a coped parapet wall two feet thick. The exterior masonry of both piers and abutments is a very neat hammer-dressed rangework, forming a system of alternate headers and stretchers, of which no course is less than twelve inches in thickness, nor any header less than three feet in length. The back-joints, both vertical and horizontal, are at least six inches in width, and are neatly pointed above high water, below which they are laid in Roman cement, extending eight inches back from the face. The material employed is a handsome, compact, gray, gneiss rock, from the extensive quarries at the Falls of Schuylkill, distant two miles above the bridge.

The interior is of rough rubble, varying in size from eight or ten cubic feet, down to a few inches; laid in full mortar, and the interstices completely filled with liquid grout, which was run in as the work was raised, at every twelve or eighteen inches. The filling in is principally from quarries of a very compact black gneiss, opened for the purpose on the eastern edge of the river, at the immediate site of the bridge.

No cramps or chains are inserted into any part of the masonry, it being considered that the large dimensions of the face stones, and the accuracy of their joints, rendered such precautions entirely superfluous. For handling the stones a long pole was planted in each pier near its foundation, and supported a sliding crane, which was moved upwards as the masonry proceeded, and finally was lifted over the top of the pole when the pier was completed, the pole itself being left enclosed in the stone work. The expense of removing the coffer-dams being considered greater than the value of the materials composing them, they were permitted to remain round the piers. The total amount of masonry in the bridge is 19200 perches.

THE SUPERSTRUCTURE.

The putting up of the timber work, which had been already prepared on the ground, was commenced at the western end of the bridge; the abutment and piers on that side having been finished some time in advance of the others. For this purpose a temporary scaffold was erected, to support the wooden superstructure; it consisted merely of slight trestles, varying from twenty-five to sixty feet in height; they were composed principally of ten by twelve timbers, strengthened by a very few transverse longitudinal braces, and placed twenty feet apart. Their legs were sunk into the mud of the river until their feet touched the rock. Notwithstanding the apparent lightness and insecurity of this scaffold, it not only sufficed to sustain the weight of the platform, but also resisted, effectually, the force of several considerable freshets, nor did any accident occur upon it from want of strength.

On the upper or transverse beams of these trestles were laid longitudinal timbers, extending from one to another, throughout the entire length of the scaffold: they supported the adjusting or raising blocks, which were merely short rough pieces of timber placed transversely on top of each other to rectify any inequalities arising from the uneven bearings of the feet of the trestles.

Resting on the blocks, and also on the piers, were laid the chord pieces C, to which were applied and attached, in order, the queen posts Q, poles P, braces R, and the curved ribs T T; after which the scaffold was removed. The settlement consequent on this latter operation, did not amount to half an inch in any arch.

The straining beams V and the straining sills U, together with other secondary timbers, were not introduced until after the removal of the scaffold.

The bridge was originally intended for the accommodation of the rail-road traffic alone; but in anticipation of a proposed turnpike to cross at the same place, it received an additional breadth sufficient for the purposes of both, at the same time admitting of a foot passage four feet in width between the two. The entire breadth, from out to out of the queen posts, is now forty-nine feet eight inches.

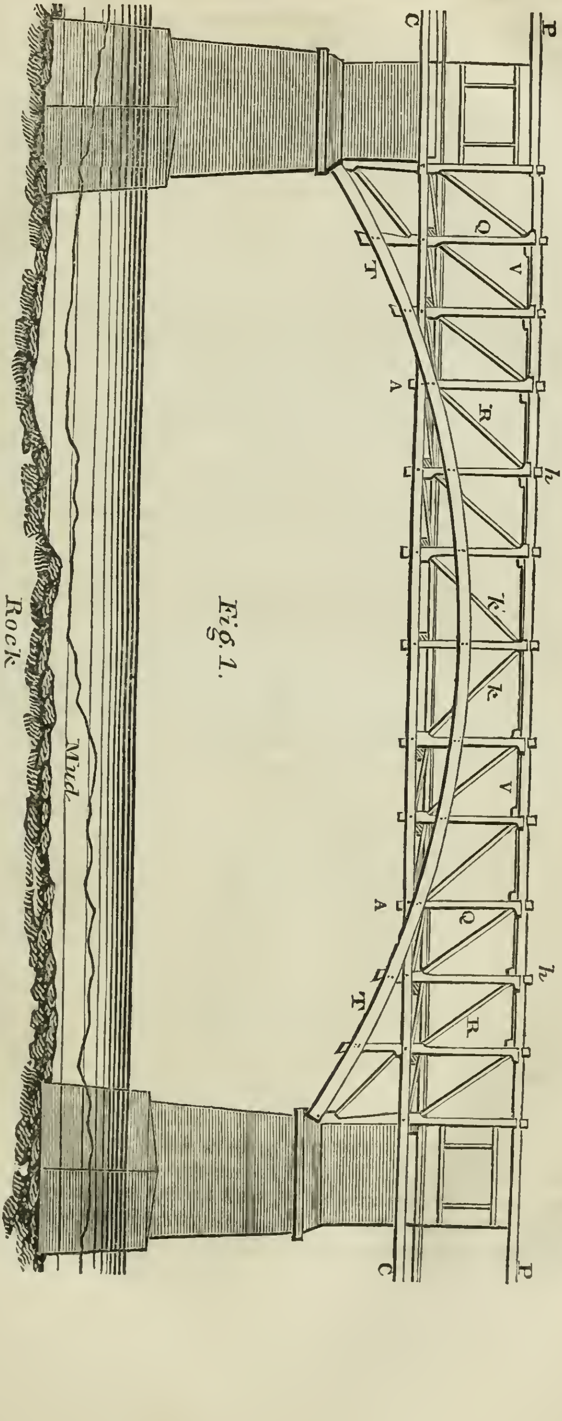


Fig. 1.
Rock
Mud
C
P
Q
V
T
A
R
h
k
k

Fig. 2.

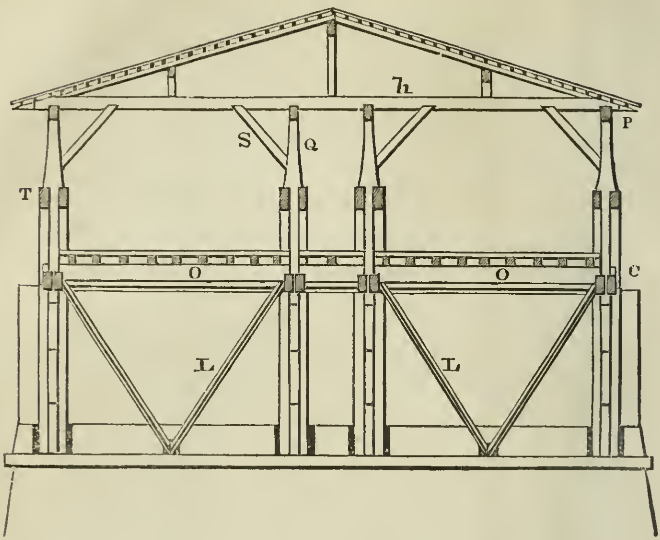
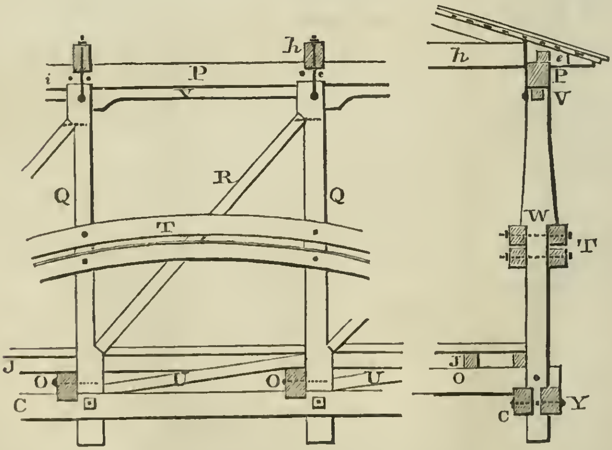


Fig. 3.



The accompanying cuts will greatly assist in understanding the following detailed description of the several parts of the truss; which is of the excellent combination so well known by the name of its patentee Mr. Theodore Burr. The same *letters* in the different figures refer to the same *parts*.

I have never seen Mr. Burr's specification, but have been informed that he attaches his claim of originality only to the carrying of the curved ribs *up into* the truss, and *there* confining them to the king and queen posts; instead of the long practiced method of placing the ribs *below* the other parts of the truss, and attaching them to the *feet* of the queen posts. I apprehend, however, that this is not the case, from the circumstance that both these particulars appear to be united in the bridge built by Grubenman over the Limmat, in Switzerland, as far back as 70 years ago. Be this as it may, however, the departure from the old truss has considerable advantages in particular cases; more especially where it is necessary to keep the roadway as low as possible, and at the same time to elevate all the timbers beyond the reach of floods. It is attended also by a small saving of timber.

But these advantages are unfortunately so far outweighed by the contour of the exterior, that it is but seldom admissible in cases where a *chaste architectural* effect is required. In the present instance no such requisition existed, and the covering was consequently made perfectly plain.

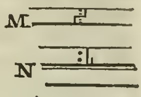
There is probably no wooden bridge in existence, (certainly none of which I have seen the representation,) that can vie in point of beauty with that erected thirty-two years ago by Timothy Palmer, over the Schuylkill, at Market street, Philadelphia,—a circumstance which reflects but little credit on the growing taste of either the builders themselves, or the companies at whose expense the bridges are constructed. So correct an exterior as *it* exhibits, can never be produced in a large bridge whose floor is placed on the *chord*, instead of the *tangent* of its supporting ribs.

One of the best features of the bridge at Peters' Island is the just proportion of its individual timbers. With the exception of the floor girders and joists, which are too small, they are generally well adapted to the spans, and would serve as standards for designing those of other dimensions.

So little attention has usually been paid to this particular that in some bridges of even 200 feet span and upwards, the timbers have not equalled in size those of the bridge now in question; on which account several have failed, and thereby rather tended to bring this particular arrangement into unmerited disrepute.

Fig. 1, exhibits a side elevation of one of the 125 feet arches, exclusive of the roof; and fig. 2 a transverse section of the same, taken at the centre of the arch, but including the roof; the former carefully drawn to a scale of twenty-four feet, and the latter of sixteen feet to an inch. The details are represented on a scale of one-eighth of an inch to a foot. The ribs are cut to the proper curve out of the solid timber, in lengths of twenty-two feet, and are in two separate parts, each eight inches broad by eighteen inches deep at the crown, and twenty-four inches at the springing. These two parts are placed ten inches asunder, so as to permit the king and queen posts, and braces, to pass between them, (see T fig. 3.) In depth, the ribs are composed of two beams, placed about one inch apart (to permit a circulation of air,) with blocks of wood inserted at every few feet to keep them separate. At the spring-

ing they abut on cast iron plates, one and one-fourth inch thick. The scarfs of the pieces composing the ribs are shown in plan by M, and in side view by N; the half laps are united by two tree-nails. Their length is six inches, and they are so placed as to break joint at every eleven feet. The king, and such queen posts as intersect the curved ribs *above the floor*, are so much wider above than below them, as to allow of two shoulders, each two and a half inches broad, by which to rest on them; (see W) and, as well as all the other queens, are still further connected to them by wrought iron bolts one inch in diameter. This is a much better plan than the usual one of *bolting only*.



The chords C are, (like the ribs,) in two pieces, each eight inches broad by fourteen inches deep, placed one and a half inch apart. Between them pass the queens and kings, which are halved to them at the intersections, and strongly bolted, (see Y.)

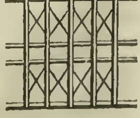
The queens are nine by ten inches, except where they rest upon the curved ribs, at which point they are increased by the shoulders to nine by fifteen. Their heads notch into the pole, to which they are further secured by mortise and tenon, through which are driven two tree-nails an inch in diameter, (see *i.*)

Between the heads of the queens, and bolted to the under side of the poles, are the straining beams V V, six by six square at their smaller ends, and six by ten at their butts. At the feet of the queens are inclined straining sills, of plank five inches thick, by ten wide. One end rests on the floor girders, and the other on the chords, (see U.)

The queen braces R, R, &c. are five inches deep by ten wide; the king braces *k*, *k*, are of the same width, but nine inches in depth. The heads and feet of both are mortised and tenoned, and spiked to the joggles of the king and queen posts. The pole P is ten by twelve. A transverse floor girder, O, nine inches wide, by fifteen deep, is placed behind each queen, to which it is bolted. Every third one of these girders is in a single piece extending entirely across the bridge. They all notch upon the chords, and support floor joists J, five inches wide by seven deep, placed two feet apart from centre to centre. On these joists are spiked, transversely of the bridge, the three inch planks, which, on the track appropriated to common travelling, form the floor of the roadway; but which on the rail-way track, support longitudinal strings of six by six, to which the iron rail bars are spiked. Between these strings is an additional thickness of plank for the horse-path.

Over each queen post, and notched upon the pole, is a transverse roof girder, six inches wide by twelve deep, confined by long bolts to the heads of the queens. (See *h.*)

Horizontal diagonal braces, seven inches by seven, disposed as shown in the figure, are tenoned in between every two consecutive girders, both in the roof and under the floor. They merely touch each other at their points of crossing, and are provided at their ends with wooden keys for forcing their tenons home into the mortises.



L, L, in the transverse section, represent braces extending from

the skew-backs of the piers and abutments, to the point of intersection of the chords with the third queen posts, (A, A, fig. 1.)

At this point also, a wrought iron tie-bar, two inches in diameter, extends across the entire width of the bridge, and is confined by burrs at the outside of the chords.

The side braces, S, are of oak, four by five inches, mortised, tenoned, and spiked, to the queens, and to the roof girders. With the exception of these, and the shingles, all the timber of the superstructure, (amounting to one million and eight hundred thousand feet, board measure,) is of white pine, from the shores of the Susquehanna. All of it that shows above the floor is planed; all below is rough; none of it is finished with that degree of nicety which would have been necessary had the bridge been in the immediate vicinity of the city. One hundred and sixty thousand shingles, of Carolina cedar, laid in nine inch courses, were required to cover the roof.

The total weight of iron worked into the timber is, cast, six tons; wrought, ten tons; the former consisting of the abutting plates for the ribs and braces L L, and of the burrs and washers for the screw bolts; the latter of screw bolts and spikes, and the tie-bars under the floor, at intersections of braces L, L, with the chord pieces.

The time that elapsed between the delivery of the rough timber at the site of the bridge, and the passing over of the first cars, was only three months, but at that time, neither the roof, flooring for common travelling, nor weather-boarding were commenced. The studs for the weather-boarding are three inches by four, and are placed vertically, two feet apart, from centre to centre. At their lower ends they are notched two and a half inches upon the chords; higher up they notch slightly on the ribs, and at their upper ends tenon into the projecting feet of the small rafters of the roof, which, for that purpose, are also placed two feet apart. The small rafters foot upon the longitudinal piece *e*, four inches by four, spiked on the upper side of the pole P. The projection of the eaves extends two feet six inches beyond the outer line of the queen posts. The weather-boarding is in horizontal courses of three-fourths inch plank, planed on both sides; not tongued and grooved into each other, but merely laid overlapping. No part of the studs, or weather-boarding, is shown in the drawing. The bridge is lighted by large Venetian windows at the sides, two over each pier; and by two skylights over the centre of each span. The superstructure was executed by Jno. P. Babb, of Wilkesbarre, Pennsylvania, by a sub-contract, under the principals, Dodd, Bishop, and Brittain, who directed their attention more particularly to the masonry. The general superintendence of the work on the part of the state was entrusted to Mr. Frederick Erdman, a gentleman whose extensive practice, and uniform success, in important mechanical undertakings, had rendered him particularly eligible to that duty.

The contract prices were, for masonry \$4 37½ cts. per perch of twenty-five cubic feet; and for superstructure \$30 per lineal foot of bridge platform. These prices include all materials, coffer-dams and workmanship of every description, no allowance whatever being made

for extras, except for such additional work, not specified in the contract, as might be particularly ordered by the principal engineer.

CONCLUDING REMARKS.

The reader will probably consider that I have occupied him too long by a minute recital of details; but as I am not aware of the publication of any paper descriptive of Burr's bridges, and believe that the deficiencies of many that have been erected might be ascribed principally to that cause, I confidently crave the indulgence of those who have found me tedious, reminding them that my object has been, not so much to present an account of this individual structure, as to furnish useful data to those who, when building for themselves, will not consider the most trifling fact as unimportant. Burr's plan for wooden bridges is perhaps the best now in use; and that at Peters' Island being probably the most correctly proportioned of any yet constructed on that principle, was better calculated than any other for the purposes I had in view.

I should, however, act at variance with my declared motives for writing these pages, were I not to exhibit the defects as well as the excellencies of this important work. They, fortunately, are very few, and will detract in no sensible degree, from the general character for utility so justly ascribed to it.

The insufficiency of the floor girders and joists has been already adverted to. The clear bearing of the former from chord to chord is nineteen feet ten inches, and their distance apart varies from nine to twelve feet; any one of them may, in the case of two heavily laden cars passing each other, be obliged to sustain a weight of from six to eight tons, which is certainly too much to be placed on a girder of nine inches by fifteen, and of twenty feet bearing, if the beam is required not to bend somewhat under it. This may easily be remedied by either placing the girders nearer each other, without reference to the queen posts, and permitting the joists to remain as they are; or by retaining the present intervals, and employing larger timbers for both girders and joists. It would be difficult to procure single pieces sufficiently deep for that purpose, but they might readily be constructed of two beams in depth, firmly connected together. The same defect exists in the before mentioned bridge at Market street. The clear bearings of the girders are there eighteen feet; their distance apart, the same; and their dimensions fourteen inches broad by seventeen deep; it was, after some time, found necessary to adopt precautions for strengthening them. Again, the height of the bottom of the roof girders above the rails is but twelve feet; it would have been more agreeable to outside passengers, on high cars, if it had been thirteen or fourteen feet.

The crossing of the stream obliquely, is, when considered in the abstract, a fault of considerable importance; but in this case it was rendered necessary by overruling circumstances, which it would be foreign from the subject to dilate upon at present.

The foot path should have been at least six feet wide.

Lastly, the starlings, or pier heads, to be perfectly effective, should

have been carried considerably higher above the surface of the water. Their use is principally tested in times of ice floods, by dividing the ice, and forcing it to glance off from the angles of the piers. But, as they now are, a broad pier face is opposed to the current, whenever the water rises rather higher than usual; and by obstructing the passage of the ice, is calculated to heap it up, and, thereby damming the stream, to endanger the safety of the whole bridge. Fortunately, however, there is but little probability of such an occurrence taking place, for the increased width of the stream at, and below, the site, allows the ice, (which is in some measure broken up by the island,) to expand itself over a larger surface than it occupied above the bridge, and thus diminish both its velocity and its consequent power to do injury. J. C. T.

Steam Navigation.

The elements of accurate history are, upon all subjects, perpetually and rapidly passing away, and the historian, in general, is compelled to resort to conjecture, in order to fill up what would otherwise be the void spaces of his charts. To obtain an accurate knowledge of the particular circumstances which give rise to, and are attendant upon, important events which occur in our own time and neighbourhood, is always difficult, and sometimes impossible. We, confessedly, owe much to the journals of the day, for materials which we could not otherwise procure, but, it need not be said that numerous causes operate to forbid an implicit reliance upon their statements, in any one particular, however talented, industrious, and honest, their conductors may be. These observations, which apply with greater or less force to every subject, do so, in an especial manner, to that of mechanical inventions and improvements. Projectors are in general ardent, and sanguine, but numerous failures mark the path of almost every one, even of those who are eventually the most successful; and however instructive the history of these failures might be, they are rarely objects which the inventor wishes, or is even willing, to place before the public, a tribunal more apt to judge of merit by success, than by any other standard; yet it not unfrequently happens that the most meritorious navigator has his barque stranded, and converted into a beacon by which others are directed into the proper channel.

Every one who has paid attention to the subject is aware of the extreme difficulty of assigning to individuals their relative proportion of honour, after an important invention has become a public benefit. Many unknown names are thereby brought to light, as candidates for the wreath of fame, all claiming to have accomplished the object, although the prize has been awarded to another. We know not of any one discovery which would serve more aptly as an exemplification of these remarks, than that of navigation by steam. We, however, are not about to enter the lists, and become disputants upon this point, as we have no new

materials to furnish, and are of opinion that most of the facts relating to it, which are now obtainable, have been put on record. Our only object in making these remarks was to provide a preface for the historical sketch of the origin and progress of steam navigation, in the Port of London, written by a gentleman now residing in this country, who was an active participator in the undertakings of which he has offered a brief detail. The essay now published will be succeeded by others, in future numbers of this journal, and will, we believe, bring to light, and save from oblivion, a number of important details, several of which were publicly known at the time of their occurrence, but are now recollected only as isolated facts. To Americans, this subject is one of particular interest, and one with regard to which theymay well feel an honest pride in having correct details every where made, as detraction from the merit of others is not necessary to their own praise.—*Editor.*

A Sketch of the origin, progress, and improvements, of Steam Navigation, in the Port of London, from 1814 *to* 1824.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

New York, June, 1834.

Sir,—So many, and such very serious, accidents, have happened among steam vessels in the United States, that it appears high time that some legislative enactment should be adopted to protect the public from their dreadful consequences: but the difficulty is in replying to the question, what fetters ought that legislative enactment to impose on a science yet in its infancy? A correct history of its progress, and present state, will be important in aiding any attempt to solve this inquiry.

The writer, having been connected with much of the early steam vessel business, in the port of London, and having had the opportunity to obtain much information from other individuals, it may be acceptable to many of your readers, to have an abstract of the march of improvement in that port, in regard to this interesting and important subject.

About August, 1814, the first serviceable steam vessel made her appearance in the Thames; she arrived from Scotland, under the name of the Margery, and in the shape of a decked boat, about sixty-five feet long, by twelve feet beam, having a common Boulton & Watt wagon-shaped boiler, and an engine with a cylinder of probably about fourteen inches diameter, and three feet stroke, with a common bell crank connexion to the wheel shaft; the size of her wheels is not remembered. Her machinery was very imperfectly made, and constantly wanting repair; in fact, she had been driven away from a station on the Frith of Forth, by better vessels; and was brought to London, in the hope of selling her to the owners of the sailing passage vessels, between that city and Gravesend, a distance of about twenty-eight miles by the river; and, as they would not hear of such a purchase, the owners of

the Margery commenced an active opposition to them. The proprietors of these vessels were all sail-makers, mast-makers, rope-makers, ship chandlers and builders, except the managing owners, who, under the charter of the "Waterman's Company of London," were necessarily all members of that body, as also were the hands employed on board; and all feared that this new power would, as it ultimately did, drive their sailing vessels out of the trade. There were then nearly thirty of these vessels, of from twenty-five to forty tons burthen, built and fitted in such a manner that each cost from $3000 to $5000. The owners could not then be convinced, that the only way to meet this new enemy was, by opposing him with a superior steam vessel; and after trying all the modes that ignorance and prejudice could devise, some of which were ludicrous and stupid enough, they at length ascertained sufficiently the opinion of an old local magistrate, to bring the matter before him, upon their charter; and he ruled, that by that document, no one but a "*Free waterman*" could navigate the Thames for hire; and inflicted penalties for infraction, which the owners of the Margery were now become at once too poor to pay, or to appeal against in a higher court, and they compromised by withdrawing the vessel, thus leaving the good citizens of London, for twelve years more, at the mercy of the triumphant fraternity of "*Free watermen,*" with their uncertain sailing vessels, or to the more costly care of the stage owners and coachmen on the road. About the year 1826, some other parties had the good sense to bring the whole matter before the King's Bench Court, where Lord Tenterden ruled, that the charter granted in the reign of Queen Anne, could not, by any means, be held to control, impede, or direct, the mode of using an invention, not made for a century afterwards. By this decision, he broke up the monopoly of the "*Free watermen,*" and the public have since had the benefit of the speed, and low rates, occasioned by the competition among the steam packet owners, and between them and the stage owners, most of whom have now left the field to their competitors. The Margery was, in 1815, sold to the French government, under Louis XVIII. and in that employ we shall have to notice her again, in the course of our narrative.

The year 1815 exhibited three steam vessels upon the Thames, one called the Thames, and one the Regent. The first arrived from the Clyde, in Scotland, having left there for the same reason that drove the Margery to seek her fortune farther south. She was bought, on the account of some persons in London, by a young engineer named Dodd, the son of the original projector of the Waterloo bridge. This vessel was about seventy feet by fourteen, and drew about four feet water, had a single vertical cylinder twenty-four inches diameter and about three feet six inches stroke, working by a bell crank connexion with a fly wheel to the wheel shaft, and having a common wagon shaped boiler. Under Dodd's care, she made the passage, in the first of the summer, by the St. George's and British channels, round the south coast to London,

to the affright of many a poor coaster and fisherman, who, never having even heard of such a vessel, imagined that the real "*flying Dutchman*" was in pursuit of him. Her arrival in London, in June, 1815, caused a great sensation; as she had encountered bad weather, and had demonstrated the practicability of steam vessels making a sea passage. She immediately commenced running between London and Margate, about eighty miles east of London, of which forty miles are sea navigation, by intricate channels among dangerous sands; and, performing the passage in the average time of twelve hours, she excited so much curiosity among the citizens of London, of all degrees, that she this year made a golden harvest for her owners, and enabled Dodd to persuade them into building a second, and somewhat similar, but larger and stronger, vessel, to be called the Majestic, to run in concert with the Thames, the following year. The sailing vessels, running between London and Margate, did all they could against this new antagonist, but to no purpose.

The Regent was built in the Thames, for a gentleman of considerable property, and high character, named Hall, who had long entertained an idea that steam would soon supersede sails. He had the misfortune to fall into the hands of an ignorant pretender to science, named John Reedhead, a native of Northumberland, who had once been a coal fitter at Newcastle, but was subsequently engaged in a few voyages in the coal trade, and, for some short time was in the employ of Mr. Whinfield, an engineer in Newcastle, who was the first that mounted a steam engine upon wheels, to drag coal wagons upon a rail-road, from the coal pits to the vessels.

This Reedhead was unable to write so as to be understood, and altogether ignorant of mathematics, and of the laws which govern the motion and power of fluids; but, he had performed some accidental service for Mr. Hall, and had gained his confidence so far that he obtained the superintendence of the intended new steamer. She was about eighty feet long, by eighteen feet wide, and he persuaded Mr. Hall to build her with two trunks, entering the bows, one each side the stem, and passing by the side of the keelson, to an open scuttle in the bottom, near the run abaft, which scuttle was surrounded by a water-tight tank, in which was placed a paddle wheel, similar to those now used; this wheel, being moved by an engine with a cylinder of about twenty-four inches diameter, and four feet stroke, with an overhead walking beam, was to propel the boat, by drawing in the water from the bow, and sending it against the aftermost side of the scuttle-tank, and thence, *downwards*, through the scuttle. The engine was worked by steam, generated in a wagon-shaped boiler, having a fire flue in it, going direct into the chimney, at the opposite end to the fire doors. But lo! on trying the engine, it was found the wheel was so deep in the water, that the crank could not be got over the centres, without the aid of a fly wheel; when this was applied, motion was obtained, but at so slow a rate, as to be useless, except to demonstrate the fact, that whatever motion the vessel had, *was stern foremost.* In this dilemma, no alternative remained, but to do away

the tank, fill up the scuttles, and lengthen the wheel-shaft, to receive wheels on the outside of the vessel; when this was done, Reedhead boasted, that the Regent would run ten miles an hour, though while in his care she never reached four. The month of August had now arrived, and with it came the third steam vessel, named the Defiance, built at Norwich, about 112 miles from London, by two scientific young engineers, under the firm of Aggs & Curr. She was seventy-three feet, by twelve, drew about three feet water, was clinch built, and an excellent model for speed, in smooth water, or river way; had two ten inch horizontal cylinders, with three feet stroke, working into rectangular crank pins, on pinion wheels, gearing into large drift wheels on the paddle shaft; the paddle wheels were large in proportion, and the engines were worked by cylinder boilers, the whole of workmanship superior to any thing that had then appeared afloat. This vessel, also, was put into the Margate trade, and had she been somewhat larger, and better fitted for the sea, she would have given the Thames some trouble; no one however would go in so low a vessel, when the lofty Thames was near, and besides this, the character the Thames had acquired was an additional aid to her.

The Regent was put into the trade to Margate, to compete with these two vessels; but a few weeks showed Reedhead's incapacity in so strong a light, that the proprietor turned her over to the care of another superintendent, one who was well acquainted with practical ship-building, and who had a correct theoretical knowledge, and some experience with the steam engine. A few days enabled this person to show the proprietor, that the wheels and engine were grossly disproportionate, the engine ill proportioned in all its parts, and the boiler unequal to a supply of steam, even with a fire so intense as to put the vessel in jeopardy, by heating the chimney *red hot*, several feet above the deck; but, as the hull of the vessel was of a good model for speed, and of quite sufficient strength, it was determined to refit her in a proper way, during the winter. On a settlement of the account of expenditures, it was found that by gross mismanagement, this small vessel had cost £8000 sterling, or nearly $36,000.

During this year, Mr. Maudslay had built a small engine, *to order*, to propel a passage and baggage vessel, between Ipswich and Harwich, which was entirely unsuccessful, owing to the ignorance of the managers, and not from any fault on the part of the mechanician.

When it was time to commence refitting the Regent, the owner was induced by Mr. M. J. Brunel, to place her in Mr. Maudslay's hands; and the result showed, that the experience of the previous summer had not been gained in vain.

In the winter of 1815–16, Dodd had followed up the building of the Majestic, on nearly the same plan with the Thames, but about eighty-five feet long on deck, with a thirty inch cylinder and three feet stroke, plain slide valve, and a common bell crank connexion; but on getting all fitted, it was found that the hull, engine, and boiler, were all so unnecessarily heavy, that the vessel drew a foot more water than she was set down for; from this, and delays in her equipments, she was not ready so soon as the Regent. The Defiance had

been sold to go to Holland, in fulfilment of a patent, granted to some Englishmen, to navigate the rivers of that country by steam; and she, during the year 1816, astonished the natives of that country, by her performances; but when, at the end of the year, an increase of accommodations became evidently requisite, a disagreement had arisen between the patentees, and on the vessel coming to England for repairs, she was suffered to lie and decay for several years, and the patent was eventually forfeited by non-user.

In June, 1816, the Regent came out, with two twenty-two inch cylinders, and thirty-two inch stroke, and four way cock valves; the engine working by a bell crank motion, through a pair of rectangular cranks, upon a pair of wheels ten feet diameter, and five feet paddle boards, dipping twenty inches in the water, and making twenty-eight revolutions per minute. The steam was generated in a square boiler, with returning flues, and the fire places all within the water. Every part was made with the most careful calculation, to have no more weight, than was needful to attain a moderate amount of surplus strength. With the boiler filled, and coals on board, the vessel drew, keel included, four feet four inches water; and previous calculation led to a belief, that she would reach about seven miles per hour, nearly the same as the Thames; but, on the first trial, it was evident she would run eight miles per hour, and could be depended on to maintain it, even against a strong wind. She now took her place, in opposition to the Thames, and always gave her an hour's start and frequently beat her another hour, in the time of arrival.

During the summer, another Scotch vessel, called the Caledonia, was brought round, and tried against the Regent; although much boasted of before commencing, she proved to be altogether worthless, and was speedily withdrawn. We shall have to notice her again, by and by. The Regent made out a successful summer, against the Thames; and nearly at the close of the season, took the first ship to sea that ever was towed by steam from London; this ship was the Oxford, Capt. Lamb, bound to Bombay, 400 tons burthen, drawing fourteen feet water; she was taken out of a tier of vessels, from between two others, and carried off, against a strong spring flood tide.

During the summer of 1816, the British government had prepared a vessel, called the *Congo*, under Lieut. Tuckey, for exploring the river of the same name, on the west coast of Africa, and had employed Boulton & Watt, to put an engine into her, which these gentlemen had made, as a common overhead walking beam engine, and wagon boiler. When finished, the Congo was too deep in the water by nearly *three feet;* the wheels so drowned that they could scarcely move, and the whole matter so badly arranged, that it was found absolutely necessary to take out the engine and boiler, and to let the Congo do her best, without any help but that of sails and boats.—Among the *junior* officers, in the government dock yard at Deptford, where the Congo was fitted, the saying "*it is well to know what will not do*," became a standing joke. Some of these young gentlemen furnished the writer with a few anecdotes, on these points, so super-

latively ludicrous, that if repeated at the present day, they would throw doubts upon the authenticity of this whole narrative.

Mr. James Watt was now near eighty years of age, but he had been too well schooled, and had too much judgment to be defeated by a failure, which arose principally from want of information among the government officers. Mr. Murdock, the undoubted inventor of the D slide valve, was at this period Mr. Watt's right hand man, and a Mr. James Brown was an assistant in the same concern, to say which, is enough to show that he was a man of talents. An old and meritorious officer in the British navy, named Wager, was sailing-master among the officers of the Warrior 74, the ship which conveyed the Prince of Orange home to Holland, in November, 1813, from which circumstance he became the leader, among the parties concerned in the Dutch patent, under which the *Defiance* was taken to Holland. He had navigated her across the North Sea, and retained the charge of her while in Holland. That vessel returning about this time, under his command, he was introduced to Mr. Watt, and employed by him to assist, with Mr. Murdock and Mr. Brown, in perfecting a nautical steam engine. To aid in this object, the Caledonia was purchased, her old engines and boilers taken out, and a set of experiments instituted, and pursued until August 1817, at a cost of £10,000 sterling, these led to a settled plan of construction, by which nautical engines were much improved. The Caledonia was a flat floored vessel, ninety-four feet long, fifteen feet wide, and eight feet six inches deep; the form of her bows very much that of the old fashioned box iron, used by housewives; the after body was finished by as clean a run as could be given from a flat bottom, to the form of the stern known as the pink stern; and when completed by Mr. Watt, she drew about four feet of water. The engines were made with two vertical cylinders; with pistons of short stroke; D slide valves between the cylinders and condensers, the latter occupied the middle portion of each engine; the slides set, to cut off at three-fourths the stroke, and to work one-fourth expansively; the piston rod connected, by a principal cross head, and two side rods, to two half-beams, one on each side the cylinder: these half-beams were placed as low down in the vessel, as would allow them to vibrate clear of the bottom, on gudgeons, one on each side of the condenser, the air pump, with rod and cross head, and two side rods to the half beams, being before the condenser. The top of the connecting rod took into a crank pin, in the face of a toothed wheel, the diameter of two feet; the two smell toothed wheels were at opposite ends of a middle shaft, and the crank pins set at right angles to each other, and this geared into a toothed wheel, on the inner end of the paddle wheel shaft, whose diameter was three feet; thus the paddle wheel made two revolutions for every three strokes of the engine, and being made of a larger diameter than usual, it was expected that the wheel would have an increased power, without distressing the engine, by too quick or too slow a motion, either in smooth water or on the sea. The particulars of the dimensions, and the sizes of these several parts, have been mislaid by the writer; but it is remembered, that the Caledonia did not reach quite nine miles an hour, and it is

believed, that the cylinders were of two feet diameter and three feet stroke, and the wheels nearly thirteen feet diameter. Changes have since been made in the details, and greater results obtained, but the general form of the best English sea-going ship engines has not been materially altered, since this arrangement was first completed by Mr. Watt.

In the autumn of 1817, the Caledonia went to Holland for a short time, and was, soon after, sold to the celebrated Steen Billé, the admiral who commanded the Danish fleet at Copenhagen, during Nelson's attack, in April, 1801, and by him was employed for some years as a government packet, between Copenhagen and Kiel.

(To be continued.)

On the effect of Momentum on different Fluids, with experiments in refutation of the opinion of M. Thayer, as stated to the Institute of France.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the last number of this Journal a notice was given of some experiments by Prof. Johnson and Mr. Espy, exhibited to the Institute at one of their monthly conversations. The object of these experiments was to detect the fallacy of the deductions made by M. Thayer from these same experiments, stated to have been described to the Academy of Sciences at Paris, and detailed in the Revue Encyclopedique for September, 1833. The following is a more detailed account of these experiments.

Mr. Thayer had affirmed that if a glass cylinder, containing different fluids, such as water and oil, for example, be placed with its axis perpendicular on a whirling table, and made to revolve horizontally, these fluids would not take a position corresponding to their specific gravities, and the known laws of centrifugal force; but that the upper surface of the water, next the oil, would be convex—and the oil would assume the form of a double concave lens.

This anomalous effect, and many others similar, were attributed by the original experimenter, as he could not account for them on the known laws of inertia, to chemical attraction, and he proposed, at some future period, to investigate more at large these chemico-mechanical effects.

Two or three of these experiments were repeated, and the cause of the *anomalous* appearance was instantly detected to be the greater or less tenacity or viscidity of the different fluids used; for that which had a greater viscidity, acquired at the commencement of the revolution, a greater centrifugal force, in consequence of sooner partaking of the velocity of the jar; and that which had a less viscidity, acquired a less centrifugal force, and therefore the oil, for instance, did assume the lenticular shape mentioned above.

It was, however, discovered by continuing the motion of the whirling table uniformly for some time, that as the water gradually acquired

the velocity of the cylinder, its centrifugal force gradually overcame that of the oil, until the lower surface of the oil became convex, and the surface of the water contiguous to it, concave.

It was also perceived that this effect was increased as the velocity of revolution of the table was diminished, or its motion arrested; for the water being less viscid than the oil, retained its velocity longer, and thus it exhibited a much greater centrifugal force.

Another kind of supposed anomaly was exhibited, and proved to be equally well explained on known principles of equilibrium and motion in fluids. Suspending a jar containing two liquids, as before, and then giving it an oscillatory motion, the surface of separation of the two was perceived to incline alternately from one side to the other, according as the pendulum reached successively the two highest points of its course. Carrying the oscillations to very great arcs, so as nearly to pass into a complete revolution, the motion at the upper point was necessarily so slow as to allow gravity to reverse the position of the liquids in regard to the parts of the phial, and this effect took place even when the revolution was complete, unless the centrifugal force exceeded the gravity, in which case they both remained at their first positions in the vessel, the centrifugal force keeping the heavier fluid at the outer extremity of the circle.

The inclined position of the surface of separation when oscillating in small arcs, was referred to the greater momentum given to the heavier fluid, and the effect of inertia, by which it tends to continue its acquired motion after the vessel had attained its highest point in the arc.

If the explanation here given of the anomalies supposed to be discovered by M. Thayer, should meet his eye, it may save him the trouble of a laborious and fruitless investigation.

Apparatus for Freezing Water by the aid of Sulphuric Acid. By R. Hare, *M. D., Prof. of Chem. in the University of Pennsylvania. Communicated by the Author.**

The congelation of water by its own vaporization, accelerated by exposure to the absorbing power of sulphuric acid, or other agents, in vacuo, has always been a difficult experiment. A distinguished professor complained to me lately of want of success in his efforts to repeat it. In November, 1832, after having three times succeeded in freezing water by the process in question, yet having failed before my class, I was led to give more than usual attention to the process in order to obviate the causes of disappointment. It appeared to me that the failure arose from imperfections in the vacuum. An excellent pump, with perfectly air tight cocks, is indispensable; and not only must the pump be well made, it must likewise be in good order; Neither should the packing of the pistons, the valves, nor the cocks, allow the slightest leakage. If a pump has been used previously for

* Originally published in the Journal of the College of Pharmacy, Philada.

freezing, by the evaporization of ether, it will not be competent for the experiment in question, unless it be taken apart and cleaned.

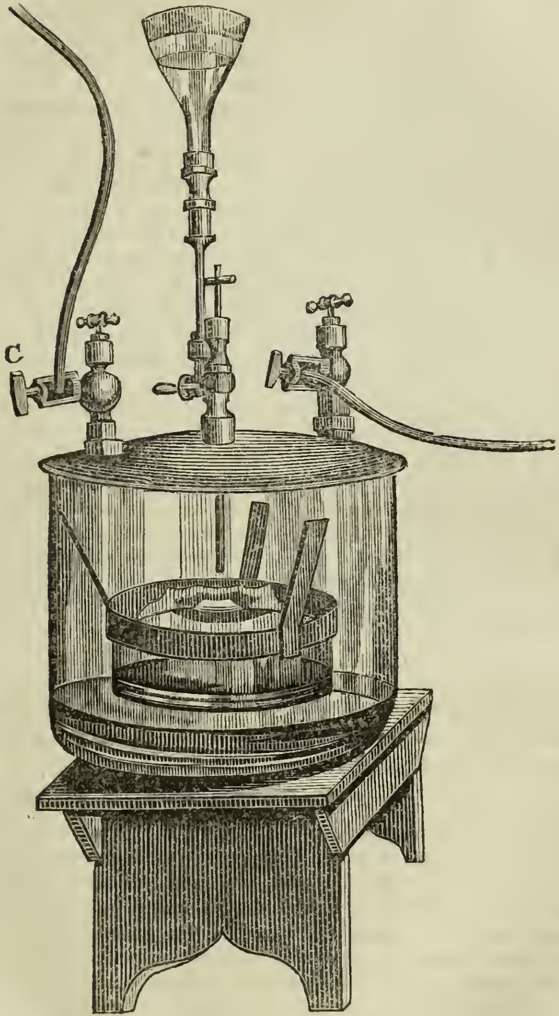
Cocks of the ordinary construction are rarely, if ever, perfectly air tight, and their imperfection always increases with wear. Under these impressions, having cleansed my air pump, and put it into the best order possible, for the purpose of obviating leakage through the cocks associated with the instrument, I closed the hole in the centre of the air pump plate by a screw, and for a receiver made use of a bell glass, with a perforated neck, furnished with a brass cap, and a female screw, by means of which one of my valve cocks was attached. A communication between the bell, and the chambers of my pump, was established through the valve cock and a flexible lead pipe, in a mode analogous to that described in the account of the valve cock. Jour. Frank. Inst. vol. xi. p. 293. In this way I succeeded in preserving the vacuum, longer than when the cocks of the air pump were employed in the process; and accomplished the congelation of water by means of the vacuum and sulphuric acid.

Latterly, I have used an apparatus which is represented by the adjoining figure, in which a brass cover is made to close a large glass jar so as to be quite tight. In operating, the bottom of the jar was covered with sulphuric acid, and another jar with feet, also supplied with acid enough to make a stratum half an inch deep on the bottom, was introduced as represented. The bottom of the vessel last mentioned was, by means of the feet, kept at such a height above the surface of the acid in the outer jar, as not to touch it. Upon the surface of the glass vessel, a small piece of very thin sheet brass was placed, made concave in the middle, so as to hold a small quantity of water.

The brass cover was furnished with three valve cocks, one communicating with the air pump, another with a barometer gauge, and the third with a funnel supplied with water. Under these circumstances, having made a vacuum on a Saturday, I was enabled to freeze water situated on the brass, and to keep up the congelation till the Thursday following. As water in the state of ice evaporates, nearly as fast as when liquid, the whole quantity frozen would have entirely disappeared during the night, but for the assistance of a watchman whom I engaged to supply water at intervals. At a maximum I suppose the mass of ice was at times about two inches square, and from a quarter to a half an inch thick. The gradual introduction of the water, by aid of the funnel and valve cock, also of the pipe represented in the figure, by which it was conducted to the cavity in the sheet brass, enabled me to accumulate a much larger mass than I could have procured otherwise. The brass band which embraces the inner jaw near the brim, with the three straps proceeding from it, serves to keep this jar in a proper position; that is, in fact, concentric with the outer jar.

In this last mentioned experiment, I employed an air pump upon a new construction, which I have lately contrived, and of which I shall soon publish a description.

HARE'S APPARATUS FOR CONGEALING WATER.



FRANKLIN INSTITUTE.

Monthly Conversation Meeting.

The ninth Monthly Conversation Meeting of the Institute was held at their Hall on Thursday evening, June 26, 1834.

Two safety chest locks were exhibited by Mr. Zebulon Locke, of Philadelphia, and were much approved.

Benj. Slater & Co. of Philadelphia, submitted for examination two spring tempered hay forks, manufactured by N. B. Harlow, of North Bridgewater, Massachusetts, and a patent concave set scythe, from the works of J. Taswell & Co. Fitchbury, Massachusetts.

Wm. Loomis, of Ashford, Connecticut, brought forward the model of a machine called by him "a helping power machine," the properties of which it is believed were sufficiently discussed to enable the inventor to draw correct conclusions in regard to the machine.

A. C. Jones, of Philadelphia, showed the saponaceous qualities of the bark of a tree, from Chili, specimens of which he produced.

John B. Jewell placed for examination a bottle which had been deposited in the copper ball of the State House (Philada.) steeple, and in which had been inclosed a parchment roll containing sundry particulars of the kind usually thus placed. The wax which covered the cork of the bottle was entirely removed, and water had obtained access to its interior, and converted the parchment into a pulp.

Prof. Bache showed the method of using the syphon proposed by Thomas Ewbank, of New York, in the June number of the Journal of the Institute; he also exhibited the apparatus invented by Prof. Œrsted, of Copenhagen, for showing the compressibility of water; the article of apparatus forming part of the collection of the University of Pennsylvania.

On some of the means of Elevating the Character of the Working Classes. A Lecture delivered at the close of the Winter Course, 1833–34, *of the Franklin Institute of Philadelphia. By* J. K. Mitchell, M.D. *Prof. of Chem. Applied to the Arts. Frank. Inst.**

It is not usually in good taste, to come before a class, with an apology for an imperfect state of preparation. Circumstances will justify me in so doing, in the present instance, as I now appear before you, not of my *own* accord, but in compliance with a request made only a few days ago. Sufficient time has not been given, even if it were *all* at my disposal, to compose a dissertation worthy of the occasion, much less could it be done in the few hours of release from the calls of a restless profession. Such as it is, however, I present it to you, with the confidence, warranted by your invariable kindness to your teachers, that it will not be subjected to the rigorous rules of criticism, but that, even without any explanatory excuse, you would make all necessary allowance for defects, and dwell rather upon the

* Published at the request of the Committee on Instruction.

goodness of the intention, than upon the imperfections of the execution.

The subject which appears most suited to an occasion like the present, is the mechanic character,—the causes of its actual and former condition—and the means of elevating it, so as to place the operative arts, on the same platform with professional pursuits. If, in executing this task, I should probe harshly the wounds which I am preparing to heal, I trust that the love of truth, and the desire for improvement, hitherto so strongly displayed by this class, will not desert it, at the very time when a full share of both, will be necessary to the process of restoration. That I have a very sincere desire to improve, and exalt, the condition of the working classes, cannot *now*, I should suppose, be doubted by any of you. I have laboured long enough, too, among the dust, and smoke of a laboratory, to feel myself entitled to the appellation of a workman; and while so engaged, have not been able to perceive any necessary connexion between manual labour and degradation; any essential disjunction of the work of the hands from that of the head; any law of nature which should make impossible, or even difficult, an alliance of good manners, high morals, and elegant accomplishments, with the active duties of the mechanic. On the other hand, I constantly perceive the immense value of all these things to the workman. He cannot bring superfluous talent to his work, however simple habit may make it appear; he cannot have too much of that patience and self-denial which are found most highly cultivated in the most polished circles; and in his dealings with his customers on the one hand, and his workmen, or fellow labourers, on the other, he will unquestionably find educated politeness, and habitual self-possession, the means of wealth, and the sources of affection and obedience. There is no one *good* quality of the gentleman which can sit ill on the mechanic, however poor he may be; this is abundantly manifested in Philadelphia, where many of the productive class, are found possessed of every gentleman-like accomplishment, and enriched and exalted by them in a way which ought to convince every one of their great importance, even in the promotion of the objects of business, and the accumulation of fortune.

In all simple and inartificial communities, persons skilled in any kind of workmanship, were held in high estimation. Even among the celestials, the amusing mythology of the Greeks had placed a working divinity; and Vulcan, though soiled by his profession, and devoted to labour, was not the less a god on that account. Aaron, although the brother of the first of the prophets, seems, in the construction of the golden calf, and of the serpents, to have applied a remarkable degree of mechanical skill. The highly educated, eloquent, logical St. Paul, was trained to the business of a tentmaker; and the *Saviour of the World*, who had been apparently carefully educated in the learning of the times, handled the axe and the saw. These, with examples nearer our own time, presented by Franklin, Fulton, Rittenhouse, and many others, show, that in the employment of the hands, there is no natural degradation, and that,

whatever may be the artificial prejudices now prevalent on this subject, manual professions may be followed consistently with the possession of every noble, and every literary qualification; and that the business duties of the mechanic are not to exempt him from the contribution of his share to the literary repute and worth of his country.

That this is not a common opinion, is unfortunately true; that it is an unwarrantable opinion, is unquestionably false. To show this in the stronger light, let us consider the causes of the present condition of the working classes, and we shall then be better able to indicate the remedies.

During the existence of the feudal system, the working classes were either the slaves, or the essential dependents of the owners of the soil. Their vassalage necessarily degraded them. Labouring exclusively for the pleasure, or interest of others, they looked upon employment as a task, the *conclusion* of which was alone agreeable, and which could not excite curiosity, or bestow satisfaction. In any event, the reward of the toil, if it happened to pass into the hands of the artisan, was insecure, because laws were then made chiefly for the protection and convenience of those who enacted them; and *they* were seldom, if ever, men who could not boast of a long line of ennobled ancestry. A sense of constant dependance—a ceaseless feeling of insecurity—create servile habits, low cunning, and habitual deference towards the sources of power and protection.

Under the most favourable circumstances, the artisan became the resident of some town or city, which had procured from royal bounty, or interest, or policy, certain immunities. But even there the tenor of the times scarcely suffered him to escape from the thraldom incident to his occupation. Either the town was subject to the overshadowing power of some neighbouring baron, to whom it paid fealty for the sake of peace or protection; or, it was under the control of petty tyrants, the offspring of corporation acts or customs, who lorded it over their fellows with that arrogance and cruelty, which we so often see exercised by those who have but recently acquired power and consequence.

Incapable of securing either wealth or station, it was scarcely to be expected that the working classes of that age, would covet, or obtain the advantages of mental cultivation; or that the education of themselves, or their children, would become an object of much importance. Even if desirable, education, as we now understand the term, was inaccessible to almost all of them. Learning, contradistinguished from science, was the fashion of the age; and, confined chiefly to the monasteries, it was hardly attainable even by the nobility. But such as it was, the learning of that period, could have been of little use to the artisan, in the pursuit, or improvement, of his profession. Inductive philosophy, the creature of the genius of Bacon, and the great light of the arts in our time, had not yet been born; and science might have sought in vain, amidst the false lustre of the school of subtleties, for one single ray of true practical knowledge. All the influences, therefore, of the times were adverse to the mechanic. There existed no consequence but that of the noble, or the

monk; no security, but that of hereditary power; no accumulation but that by the king or the baron; no education but that which, inaccessible to the artisan, could not, if attainable, have elevated his intelligence, or illuminated his pursuits. It is not, therefore, so much a matter of surprise, that he sunk into ignorance and degradation, as that, in spite of such sinister influence, he should have been able to sustain so much respectability, and to contribute so much to the advancement of the manual arts.

A pursuit, essentially dependent, affording no security for its gains, and unadorned with the lustre of education, is never adopted by any but such as are driven to it by necessity, or inured to it by habit. It is therefore followed, usually, by low and vulgar minds, and is consequently in danger of becoming still more degraded in their hands. It was so with the mechanic arts, and their cultivators, down to that period, when a great variety of causes, political, moral, and religious, began to react on the monopolists of privilege and power, and brought the people into the possession of a share of both. Among the most influential of these causes, was the growth of great towns. As a community becomes more extensive, individuals lose their prominency, and the public is more conspicuous. Units are merged in aggregates; and as the mechanic was lost from sight in the vast mass of human beings, he was left to the less fettered pursuit of his business, and his happiness. He was more at ease, and, of course, more industrious. He was surer of his gains, and consequently more eager to embrace all the means of acquisition. He felt that education could be made a source of distinction, and as it was now attainable, he sought it, both for pleasure and profit. A common cause, a general interest, often brought him for the sake of gain, or the repulsion of invasion, civil, and military, into concurrent action with the merchant, the lawyer, and the physician; men who had long before him broken through the barriers of exclusive privilege, and asserted *their* claims to a share of education and refinement. Such association could not fail farther to increase the nominal, as well as real, importance, of the mechanic, and to add to his social value, as well as his intellectual culture.

Yet even under the most favourable position assumable in Europe, even now, the mechanic is exposed to the deteriorating agency of many artificial arrangements. Subjected to a long apprenticeship, he must begin his course of manual labour at least as early as thirteen, and is of course debarred from acquiring that kind of education, which is to him of the most vital importance—a *philosophical* education. That is not attainable at so early an age. A very great many of the towns of the civilized part of the old world, are incorporated, so as to exclude from the exercise of an art, those who have not inherited, or bought its "freedom," even though regularly indented, and legally authorized to practice it elsewhere. Besides, the artificial distinctions in the society of these countries, are perpetuated as well by law as custom, and a tradesman there is scarcely yet tolerated in using the dress and the habits of what they call the better classes.

These numerous artificial causes have had the effect of creating a degraded estimate of the value of the mechanical professions, which has travelled across the Atlantic to us, and like many other of the feudal and aristocratical falsities of Europe, has been unfortunately ingrafted into the very substance of society in this country. It is for this reason that some callings are esteemed more genteel than others, which are as intrinsically noble and useful. You well know that the profession of the lawyer or the doctor, though properly speaking unproductive, is esteemed more honourable than that of the mason, the carpenter, or the blacksmith, which is continually promoting the wealth and the power of society.

Thus far, then, the mechanics are not censurable for holding, in the scale of society, a station inferior to that to which, by their wealth, numbers, political consequence, and public usefulness, they should be entitled. But it is not in accordance with the good sense, good feeling, and love of justice, so conspicuous in the American character, to continue the pressure of the odium of a *caste*, unless the people upon whom it weighs, by neglecting the means of escape from it themselves, become voluntary sufferers, and rivet the fetters thrown around them by ancient usage and imported prejudice. If, then, the American mechanic is not yet, however truly estimable, rated as he ought to be, the cause will be found, most probably, *in his own hands.*

If we carefully weigh the conditions essential to the honourable reputation of any profession, or class of individuals, they will be found chiefly in the degree of moral cultivation demanded either by usage or by business. For this reason, the divine, the lawyer, and the physician, pursue avocations held in the highest respect in every country where they are really learned professions. In these employments, the books to be consulted are numerous, and many of them in foreign or dead languages. To the due comprehension of these, a good preliminary education is indispensable. The gentlemen therefore of law, divinity, and medicine, are generally possessed of a considerable degree of classical learning, which, elevating their taste, and refining their sentiments, renders them both agreeable and instructive companions, and makes them welcome, as such, to the best society, of which they become an essential and important part. But to the successful cultivation of most, if not all, of the mechanic arts, a preliminary education, beyond the mere elements of the vernacular language, has unfortunately not been esteemed necessary; and hence, as a class, mechanics have not been noted for those companionable qualities, which, giving zest and grace to society, render their possessor a desirable acquisition. How seldom is a youth, destined for a handicraft business, found passing through the ordinary routine of a college course, or employed in the acquisition of the foreign languages, in which may be found written much which, as an artist, it would import him to know. The loss thus sustained, is of much greater importance than, on a superficial observation, may be made to appear. It is in the gentle breast of tractable childhood, that we must plant the seeds of the tender and delicate sentiments. It is then

alone that the mind receives a graceful flexibility, and imbibes a taste for elegant pursuits, and refined sentiments. Our original nature is so rough, selfish, and cold, that it requires years of sentimental cultivation, to tutor it into the smoothness, self-denial, and generous warmth, so essential to the harmony, the elegance, and the interest, of social intercourse. This is almost instantly perceived by an uneducated man, when brought, by the force of circumstances, into the presence of those who have enjoyed the invaluable blessing of a good education. If he is observant, he will be forcibly struck with the charms of good society, and will lament, as thousands have done, that the opportunity of acquiring such things is gone, gone for ever. Although there are men so constituted by nature, as to need little polish from the study of the schools, and the example of cultivated minds, they are not common;—and the fine lines of Pope will be found generally true—

> "'Tis education forms the *common* mind;
> Just as the *twig is bent* the tree's inclined."

When we carefully examine this passage, we are struck with the exception implied by the word "common." Pope, who has written on the ruling passion, knew well, that men of peculiar moral conformation, could not be formed by education, but used education for the promotion of favourite pursuits. Examples of men rising superior to the obstacles of ignorance and poverty, into a surprising degree of consequence, are however much more common, than those of escape from the contamination of early bad-manners, to agreeable ease, and acceptable social elegance. But even such instances, if more common, should not prevent a parent who designs his son for a mechanical pursuit, from giving him, if practicable, a good classical education. Such a course would appear singular at first, but if generally followed, would cease to attract notice; and the favourable difference in the social consequence of a highly educated mechanic, would attract a crowd of imitators; and after no very protracted period, the artificial barrier now left standing between various classes of society, would be broken down; and the last relics of our feudal origin, and transatlantic prejudices would be extinguished. That, however, must be done by the mechanics themselves. They must cultivate the means of advancement, to be advanced; and cannot rationally complain, if, having deprived their sons of the ordinary accomplishments of good society, they should be kept out of it by a sense of their own inferiority, or the good taste of those who compose it.

It may be said that a mechanic has not *time* for the pursuit of classical and elegant literature, and that, if possessed, it could not promote the interests of his business. There *is* time. If a boy, whose mind has been disciplined by education, and whose intellect has been sharpened by exercise in the schools, be finally sent to the study of a trade, he will not only learn it in a shorter time, but he will learn it better, less mechanically, and more intellectually. It will scarcely be denied that as much time is necessary to learn the

science of medicine, as to acquire a knowledge of any other art whatever; yet we perceive, that in three or four years, a clever student of physic possesses himself of an amount of science, which would appear incredible to one unused to the acquisitive power of early training, and habitual mental exertion. The preliminary moral *gymnasium* of his classical schools, gives such force, flexibility, and retentiveness to his faculties, as to enable him to do, in three or four years, what, without such preparation, he could not, even if at all possible, accomplish in twice as many.

If such an education were usual with mechanics, it would afford them a new and elegant recreation, without diminishing their zeal for their art. And as their art would, by such means, become itself more respectable, they would not feel themselves degraded in its pursuit. In a solitary road of upper Virginia, I was attracted by the appearance of a Yankee pedlar, who, with great enthusiasm, recited verses from a copy of Virgil, descriptive of a scene similar to a very striking one then before him. I naturally inquired into the history of such an individual, so engaged. He informed me that his father had given him a good classical and philosophical education, and had brought him up to the business of a tin-smith. At this trade he had worked assiduously for many years, during which he had beguiled his hours of leisure by classical reading. "Virgil, Sir," said he, "is my favourite author, and I never go on a journey without him. He is good company. He shortens the way, enlivens an evening or a rainy day at a tavern, and enables me to bear better the usual adversities of my diversified life. I make my tins myself, harness my horse, load my wagon, and journey now and then to the south to sell them." Here you see that a classical scholar, a man of taste, in fact a cultivated philosopher, was not ashamed to pursue a very common mechanical business, and he did it with skill and attention. It was the custom of his home, familiar to him, and it elevated not only the individual but the business. *Time* too had been found, not only by him, but many others in his neighbourhood, to educate themselves classically before they entered on a trade. It does not appear that their time was lost, even with reference to their business, since they were quite as skilful in it as those who went to it early, and brought less sharpened understandings to the work.

Even if *money* were the *sole* object of life, the chance of its attainment would not be lessened by a good preliminary education. But money can be valued properly only as the means of obtaining rational enjoyment. If, then, in a refined education, are found new sources of pleasure, new powers of promoting happiness, and respectability, we have one of the best things that money can buy—a good, too, not as easily lost as money, and which, after our youth has gone by, cannot be purchased by the wealth of the world.—Bodily activity is so natural to youth, that all young animals are, when awake, in constant motion. It is almost impossible for one of riper years to follow a child through the evolutions of a single day. The little fellow, obedient to impulse, exerts every muscle, stimulates every nerve, trains every member, and every sense, for future use,

and happily seldom requires either solicitation or instruction, to prepare himself *physically* for his part in the drama of life. Nor does nature forget to train, at the same time, his moral powers. The acquisition of knowledge made by the time a child reaches the end of its third year, is stupendous. But while the muscular education goes on as rapidly as ever, the moral exertion begins, from that period, to decline, and a less stimulated curiosity exerts over the mental faculties a less active control; and unless a systematic education be substituted for the waning discipline of nature, the mind becomes listless and less enterprizing, loses its habitual acuteness, and presents to the observer the man of nature, such as our aboriginal people, active, strong, cunning, incurious, ready for war, for hunting, or the dance, but averse to moral labour, and insusceptible of all the softer and more elevated enjoyments of life.

The want of that cultivation, which, by exciting his more tender and graceful sentiments, best fits a man for the society of females, while it steals from him the sweetest and purest enjoyments, deprives those who have a right to expect better things at his hands, of all that delightful intercourse, which classical taste, and literary refinement can alone produce. Sensible of this, coarse and vulgar men are seldom found, at night-fall, within the precincts of home. Incapable of entering into the feelings, or of participating in the gentle pleasures of domestic life, they are found congregated together in lodges, at taverns, at shows, or theatres, or in any place where they may find refuge from vacuity in strong excitement. Their women are left to themselves, and all of a father which his child can know, is as an eating animal at meal times, and an absentee at night. Such is the result of a want of refined education in any class, or in almost any individual; and if large, and very important sections of society, voluntarily abstain from such improvement of themselves and their children, although they may occasionally present, as I *know* they do, many very honourable examples to the contrary, yet, as a class, they must suffer loss, both in the means of happiness, and the estimation of society.

The neglect of classical education, among those to whom it was formerly deemed an indispensable accomplishment, is among the most alarming signs of a decay in one of the most interesting departments of American civilization. By degrees, merchants and others engaged in pursuits not immediately dependant on classical learning, have imbibed the opinion, that an acquaintance with elegant literature disqualifies a man for business, and that few of those who have a classical taste or predilection, succeed in the active duties of life. It is true, that when a man gives *superior* attention to his amusements of any kind, and postpones his occupation and his interest, for his pleasures, he will fall short of success. A theatre—a grog-shop—a club, may also trench too much on a man's time and attention, and work his ruin more effectually than Milton or Homer, and that too without leaving him those bright fragments of enjoyment which, amidst broken fortunes, remain for him who has preserved his innocency and

his taste. The objections to learning, like the objections to all that is good in itself, are necessarily derived solely from its abuse, and ought not to militate against its use. In Europe, many of the merchants, whose financial skill has filled the world with their renown, are men of high finish and elegant accomplishments; and in Boston, it is a very common thing to find the student of Greek and Latin classics, in the compting-house, there distinguished for the skilfulness of his speculations, and the wealth acquired by his wisdom. With us, unfortunately, the opinion of its hurtfulness leaves us but few opportunities to judge of its value, and unless we soon divest ourselves of this absurd prejudice, we shall not be able to find at home, the seminaries in which it will be possible to recover our lost ground. Already they present strong symptoms of decay, and in a few years, unless the working classes will in this, as they do now in many other things, set a noble example to those who have voluntarily divested themselves of the only rational ground of distinction, our colleges and classical schools must entirely disappear. In the city of Philadelphia, there are probably not less than thirty thousand families. If in each of one-third of these families, there exists one young man of a fit age for college, we have at least from five to ten thousand young men qualified by age, at least, to be in the course of education in such an institution. But will it not surprise you when I say, that Philadelphia does not send to all the colleges of the Union, a number of young men sufficient, if collected together, to well support one single institution. Since I have been familiar with this subject, there have not been more than one hundred and fifty youths of Philadelphia, at one time, at all the colleges of the Union. Nor has this arisen from a deficiency of skill in the professors, either here or elsewhere. At this moment, our own University is rich in the means of instruction, and at a rate which would not tax severely the purse of the poorest master-mechanic; and I *do* trust that, in a very few years, the Institution, in whose Hall I now address you, will present still cheaper access to elegant, as it now does to scientific education.

Amidst so many things to admire in us and our institutions, even the most friendly foreigner observes with regret our deficiency in elegant literature, and the consequent infrequency of writers of taste. We are free, well informed, industrious, affluent, ingenious; but we are grave, deficient in enthusiasm, and almost wanting in the higher graces of conversation and literature, to which society owes, elsewhere, its greatest charm, and without which, we lose much of the sweetest enjoyments of life. Much as I love my home, greatly as, on the whole, I prefer this, my native land, to every other, and I have seen them nearly all, still, knowing as I do, the great enjoyment to be found in that society where the mind of almost every one is refined by acquaintance with the polite writers of every age and country, I cannot resist the feeling of regret at the loss we voluntarily incur, nor can I refrain from expressing the hope, that the time is not far distant, when high refinement, and manual labour will not be found incompatible, and when *our mechanics* will be entitled, *in the very best sense of the word*, to the name of *gentlemen*. Coarseness

and vulgarity are disgusting, even to the vulgar, for there is no man, however gross himself, who does not feel pleased at the improved manners and literary attainments of his son; just as there scarcely ever existed a drunkard who did not love to see his child averse to the destructive vice to which he had himself become the victim.

Highly as we may estimate classical education, as a means for the advancement of the happiness, the worth, and the companionableness of the mechanic, there is another department of learning, still more essential to his professional interests. Science, as contradistinguished from learning, enters into every, even the humblest and simplest mechanical occupation. Not to mention those trades in which it is obviously applicable, such as instrument making, clock making, machine making, &c., men engaged in leather dressing, dying, tanning, fulling, &c. are constantly employing scientific processes, and do this better, or worse, with more or less prospect of inventive, or judicious results, according to the greater or less familiarity with their principles.

That mechanics have not closely studied philosophy, is attributable chiefly to the thraldom of prejudice, and the disabilities which, created in feudal times, are not yet removed, even in our own age and country. In other countries, and at a more remote period, philosophy was the privilege of but a few, to whom hereditary wealth, or professional necessity brought the boon. *Experimental* philosophy, at least, was taught in but a few expensive seats of learning, to which scarcely any one but a member of the hereditary aristocracy, could find access on any terms. It was then impossible for a boy, devoted by his pursuits to any manual occupation, to obtain admittance to such places of instruction, and, *if* possible, the enormous expense operated as a preventive; for if that could be afforded, the then profits of the anticipated trade would have rendered it inexpedient. That which was, in former ages, a necessary ignorance, became, as it were, a badge of degradation, and illiteracy and labour were so commonly united, as to be esteemed inseparable.

So hurtful is this evil, in the eyes of some of the greatest men now alive, that they have almost devoted themselves to the duty of enlightening and reforming a class essentially the most important to the interests and welfare of society. Lord Brougham, Dr. Birkbeck, &c. are now labouring hard to make knowledge cheap and accessible, and to persuade the artificers of all kinds to throw off the shackles of the worst description of tyranny, that of professional ignorance and apathy. In this they have succeeded to a very remarkable degree, and while we are boasting of the revolution which gave us the mastery of ourselves, we are submitting, even yet, to the most degrading influence of the mechanical and aristocratic institutions of the country from which we were delivered, and I fear, permitting the people from whom we separated to outstrip us in that kind of knowledge which is the true source of individual advancement and national prosperity.

Within a very few years, however, a new spirit begins to pervade the labouring classes of our city, and at length, desirous of advancing to the station long since accorded to them by our national insti-

tutions, they seem resolved to prepare themselves for their professions, in the same philosophic manner as the divine, the lawyer, or the physician. This is as it should be; for otherwise it would appear singular to boast of our national independence in language which, itself expressive of ignorance, betrays the lamentable dependence on foreign influences of the basest and most dishonourable character. The time has at length I hope come, when *profession* will be no longer a plea for *ignorance*, or *trade* an excuse for *coarseness* and *rudeness*. Henceforth, a mechanic, ignorant of the principles on which his art is founded, will scarcely be better tolerated than would a physician who should dare to practice his art, when convicted of ignorance of the philosophy of the circulation of the blood. While debarred the schools of science, by the exclusiveness of the aristocrat, or the high price of learning, he might be pardoned for an unavoidable ignorance; but now, when science opens her arms to receive him, and beckons him to her temple, he must enter her honourable courts, or blame himself alone for his exclusion. And if despised by those who have embraced the rejected opportunities, he finds himself lowered on the scale of society, let him remember that, in our country at least, it is impossible to support long any other distinctions than those of talent and learning, and that *he* will be considered most noble, who is so indeed, and *he* most agreeable and most welcome, who by great cultivation, has possessed himself of the affluence of the powers of pleasing. The revolution begun in '76, will not be completed until the artificial barriers of society, instituted in Europe, have been entirely overthrown; and that can be done solely through that cultivation which will render them unnecessary. In Europe, a vulgar and ignorant man may be found among an hereditary aristocracy, and be sustained by the privileges of his class; but here, such distinctions have happily vanished, and such a man will, whatever his wealth, or his profession, sink into merited contempt.

I feel greatly encouraged by the zealous and untiring pursuit of knowledge evinced in the class I am now addressing. Every night, regardless of the inclemency of the weather, you have filled this spacious hall to its very walls, and have expressed no impatience at demonstrations necessarily prolonged, and often deficient in direct interest. All this augurs well for the future, and promises us a harvest, of which the good seed will be again sown for future increase. Let the mechanics of one generation be, as they should be, philosophically educated, and, in America at least, such an education will become forever indispensable. You have, therefore a double incentive to exertion. Your own respectability and interest, and the elevation of the character and pursuits of your successors for all future time, seem to be now in your hands, and in improving yourselves, you will benefit and exalt your country.

If the magnificent bequest of the late Mr. Girard should be applied as it ought to be, I think the mechanics will receive an impulse from an unexpected quarter. It is now almost certain that the orphan children who are to enter the Girard College, will be carefully educated in classical learning, and fundamental philosophy, and will most of

them afterwards engage in operative pursuits. They will soon form a numerous body of mechanics of the very best quality, and render an equally good education imperative to others; for be assured, as you may be by the many fine examples already among yourselves, that exactly in proportion to the intelligence and skill of the workman, will be his success in business. The doctor may practice unworthily, yet extensively, his hidden art; the merchant may, by good fortune, succeed, without education, in his adventures abroad, and his speculations at home; but the mechanic must, in his less eventful occupation, depend for success on his merit and his skill, and these will be proportionate to his natural and his *cultivated* faculties. His defects, if they exist, cannot be concealed, and his good qualities must be apparent in his productions. These always speak an intelligible language, and are generally of a very obvious character.

Every thing around us which relates to the advancement of the operative arts, is of an auspicious character. That is, indeed, amidst the existing tendency to the decline of literature amongst us, a subject of unfeigned exultation, because it is not possible that a general scientific movement on the part of the mechanics, should be unaccompanied by an improvement in the education of every other class of society. That part of society which has unfortunately been permitted to monopolize the classical distinctions, will not tamely see you transcend them in science, but entering on a very honourable and profitable competition, brighten themselves and stimulate you. This is the only warfare which should be conducted by various classes of society, among us, and its end should be the triumphant success of all.

It is vain for one section of society, in our country at least, to envy another its superiority or its influence These follow knowledge and manners as naturally as the brightening of the face of the landscape does the rising of the morning sun of spring. By numbers, a set of educated men may be divested of power, or consequence, but it will only be to put another set of the very same kind in their places, and those who have made the change, if themselves uneducated, will not be benefited by the alteration. While society maintains the forms of orderly government, such is the case in all free communities. Monarchies and oligarchies present occasional exceptions, and sometimes during the reign of civil commotion, spirits, from the vasty depths of ignorance, rise, through extraordinary force of character, to ephemeral exaltation. Sooner or later, however, the natural tide of events flows on, and those best qualified to guide the councils, and direct the destinies of society, will be found at the helm, through the spontaneous choice, too, of those who have not prepared *themselves* for the station. To obtain a share of power, to become eligible companions, welcome associates, to raise the credit of the class, and wipe off from it the involuntary stains brought from feudal times, and foreign countries, and to remove the badges of mental degradation, voluntarily assumed even here, the mechanics must not waste the time in unavailing regrets, and useless jealousies, but, buckling on the armour of learning, and seizing the sword of science, advance

to the combat for an equal station, with that ardour which must conquer, and that knowledge which will make the victory honourable to themselves and glorious to the country—the whole country—and I was going to say, nothing but the country. But no! no! that will be a victory auspicious to the *world*. So grand a spectacle is seldom seen in the universe. A whole community of mechanics, refined by literature, polished by good society, illuminated by philosophy, enjoying *all* the pleasures and honours of education, and carrying the arts irresistibly forward, to a degree of excellence of which the present age, with all its hurrying progression, sees but the beginning. That cause, once well begun, can have no limits but those of the world, no overthrow but that which must come to all things, when "*Time* shall be no longer."

So truly honourable a result, will throw back great reflective credit on the institutions in which originated the efforts for melioration: and among such institutions, none will probably, in our country, hold a higher rank than the *Franklin Institute of Pennsylvania.* It is but a very few years since a small number of individuals, most of them yet young, conceived the idea of affording, at a cheap rate, the sciences to the working classes, and all others who might be unable to apply to more expensive places of learning. With almost incredible zeal, did they collect the funds, and erect on a lot purchased in a central situation, the noble edifice in which I have now the honour of addressing you. A Board of Managers was elected, a Committee of Instruction appointed, and the best teachers sought for and found. Many of you must remember the zeal and skill with which Doctor Thomas P. Jones conducted the course of experimental philosophy, and practical mechanics; and with how much admirable science Professor Keating combined the power of throwing charms around the processes and the theories of chemistry. Professor Franklin Bache,* who followed him, is yet agreeably remembered for his profound knowledge, exact method, and exemplary precision; for the efforts which he made to call your attention from the striking experiment to its connexion with, and illustration of, the great principles of the science. Of the deep research, and instructive course of my present fellow labourer, Professor Johnson,† I could say much which would meet with a ready response from a class, which has acquired the title to estimate their merits, and unquestionably is inclined to fully appreciate their great desert. At the call of the government, Mr. Franklin Peale‡ has gone abroad to examine and report on the processes pursued in the mints of other countries, and for the past season we have been deprived of his ingenious, amusing, and instructive lectures. But Doctor Emerson,§ and Mr. Millington,‖ have filled up his evening by discourses at once improving to you, and most creditable to themselves.

It is not alone, however, to the lecture-room that the merit of the Franklin Institute is confined. Through the aid of the committee on publications,¶ and the variety and extent of his own accomplishments,

* Now. Prof. of Chem. and Pharm in the College of Pharm. † Prof. of Nat. Philos.
‡ Lect. on Practical Mechanics. § On Meteorology. ‖ On Astronomy.
¶ *Committee on Publications.*—Prof. A. D. Bache, Isaac Hays, M. D., S. V. Merrick, M. W. Baldwin, Rufus Tyler.

Dr. Jones is enabled to conduct, in the name of the institution, a *Journal* remarkably well calculated for the promotion of knowledge among mechanics, and the furtherance of the scientific reputation of the country. That Journal is not only read with advantage at home, but is often, in the most flattering manner, quoted by the best scientific journals abroad. It has continued, for several years, an unwearied flight, and, as yet, has moulted no feather of its well-earned reputation. I need not fear reasonable contradiction when I say that no similar institution has sustained so long, and so well, an equal magazine.

In addition to these claims to public estimation, the Franklin Institute has conducted, and is now conducting, toilsome and very expensive experiments on some of the most important questions in practical science. With much labour, and great expense, experiments have been made on most of the requisites of water wheels and adjutages,* so as to finally settle a point of great importance to every one who employs water power in the movement of machinery of any kind. The unfinished report of the committee on this subject, is a masterpiece of its kind.

The investigation of, and report on, weights and measures,† made by request of the House of Representatives of the State of Pennsylvania, adds a new claim, on the part of the institution, to public approbation, while the committee on steam explosions,‡ will soon put in another, of no inconsiderable weight, for an indefatigable, hazardous, and expensive series of experiments, under the patronage of the government of the United States, most ingeniously diversified. A very great deal of the labour and skill applied to these investigations, has been bestowed by private members of the Institute, unpaid, and without any other motive than that of doing good to society.

I have made this exposition of the doings of the Franklin Institute, not for the vanity of the display, but for the sake of justice, and example. Our own citizens, perhaps even the members of the Institute, have not been fully aware of the extent, variety, and importance of its public services, nor acquainted with the honourable nature of its claim to the support and countenance of our community.

It might be supposed that I had now stated all the merits of the Institution; but when I look to the left, and see before me a large proportion of females, attentively engaged in receiving instruction, I cannot refrain from exulting in the prospect of great gain from their example, as well as their improvement. It has been said, and I believe most justly, that the character of the child is formed or deformed by the example and instruction of the mother. She is intrusted with the discipline of thought, at that critical period of life,

* *Committee on Water Power.*—S. V. Merrick. Benj. Reeves. Isaiah Lukens, Rufus Tyler, Andrew Young, M. W. Baldwin, John Levering. John Agnew, Saml. Hains, Jas. P. Espy, Fredk. Graff, James. J. Rush, W. H. Keating, Prof. Alex. D. Bache.

† *Committee on Weights and Measures.*—Prof. Alex. D. Bache, S. V, Merrick, W. H. Keating, Rufus Tyler. M. W. Baldwin, Benj. Say, Asa Spencer, Abm. Miller, Thos. P. Jones, M. D., Prof. Robt. M. Patterson, S. C. Walker, Benj. Stancliff Thos. M'Ewen, M. D., Edm. Draper, David H. Mason, Benj. Reeves, Fredk. Fraley, Saml. Hains, Saml. Moore, M. D.

‡ *Committee on the Explosions of Steam Boilers.*—Prof. Alex. D. Bache, Prof. Robt. Hare. S. V. Merrick, W. H. Keating, Isaiah Lukens, Jas. J. Rush, Jas. Ronaldson, Fredk. Graff, Prof. Robert M. Patterson, Prof. J. K. Mitchell, Benj. Reeves, George Fox, Thos. P. Jones, M. D., Prof. W. R. Johnson, M. W. Baldwin, James P. Espy, Geo. Merrick.

when, through the flexibility of the mind, a bent is easily given to character, and the young ideas just begin to shoot. It is her care to protect the tender blossoms of thought and feeling, to prune rank luxuriancy, encourage honourable sentiment, and kindle the love of labour, and the taste for learning. She should not be found often unable to satisfy the curiosity of her child; nor should his eager thirst after knowledge be destroyed by the oft repeated declaration of impatient ignorance. How many Newtons have been withered in the bud—how many Franklins consigned to obscurity by the presence and the influence of a mother, who, herself totally ignorant of the value of knowledge, feels no disposition to encourage in her child, the love of science, or a taste for the arts!—Oh! if a mother in *feeling*, ought she not to long to brighten in the bosom of her child, a taste, which, while it will afford him many an hour of delightful recreation, and open to him an agreeable path to honourable distinction and public usefulness, will also shield him from the thousand snares of vice set for the idle, the ignorant, and the obscure. But more! many, very many of those who now hear me, pursue the creditable and useful profession of *teaching*, and are, like the honey-bee on his flowery embassy, abstracting the sweets of learning, to carry them home to a busy and eager school, to be again scattered far and wide, for the benefit of society. This is the compound interest of learning—the field which produces a thousand fold.

Let Philadelphia, justly proud of this Institution, so munificent of good, continue to carefully foster it; and let the mechanics, to whom it more especially belongs, forget not, that it is the first great step of their advancement to their proper station in society, and cherish it as at once most useful to them, and most creditable to their character.

If we should, by the permission of a kind Providence, again meet in this place, you will find me prepared to extend and improve the system of instruction in my department. I have caused to be made models of buildings, and implements used in the arts, which, for want of time, I could not exhibit during the present session. In the next course, I shall be able to present to you the interior of the glass-house, the pottery, and the iron-furnace, displayed in sectional models, in which will be made readily comprehensible, the various processes by which glass, china-ware, and iron, are produced. I have no doubt that my able colleague will make at least equal exertion to improve and extend *his* course, and that the next season will greatly exceed the last, in the value and variety of its instruction.

The least agreeable part of my task remains. I am now to take a final leave of you for the season. In doing so, let me not forget to thank you for the polite and quiet attention paid to my feeble endeavours to please and instruct you; for the patience with which you have borne disquisitions necessarily tedious, the respectful silence during the hour of lecture, and the avoidance, at its close, of any noisy demonstration of a satisfaction, not unknown to your teacher, but conveyed in a manner worthy of the place, of yourselves, and of the cause of science. These things console me for the toil, expense,

and inconvenience, of a course, which, under the pressure of heavy professional engagements, has not been conducted in such a manner as either to benefit my purse, or economise my exertion. Yet, thanks to you, I feel amply compensated for these sacrifices, by the persuasion that society is benefited, and that you are kind enough to be satisfied with my exertions.

And now, permit me to wish you a prosperous summer, useful, agreeable, and profitable pursuits, and a return to the course of the next season, more highly prepared to receive instruction yourselves and to convey it successfully to others.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JANUARY, 1834.

With Remarks and Exemplifications, by the Editor.

1. For a *Plough Plane;* Israel White, city of Philadelphia, January 9.

In the specification of this patent considerable space is taken up by the description of the plough used by cabinet makers and joiners, as it is usually made; however, as no one will feel interested in the improvement who is not acquainted with the instrument in its present form, we omit this description altogether. For many years past it has been the practice to regulate the distance of the fence from the plough iron by means of two arms having screws and nuts on them; previously to this, the arms were made smooth, and fitted nicely into holes made in the block of the plough, where they were tightened by wedges; the plough now patented may be considered as a modification of these two modes. It has three arms, the middle one of which has a screw and nut, whilst the two outer are cylindrical, and slide easily through two holes in the block. The intention of this is, to preserve the parallelism of the fence to the plate of the plough, without the trouble of setting both ends by the rule. The stop, or slide, which regulates the depth of the groove, is formed in the usual manner, but a mortise, or slot, is made through the side of the plough on to the brass part of the slide, which has graduations upon it that indicate the depth to which it is set.

Fillister's, and other planes, having similar moving parts, are to be made in the same way. The labour of making planes upon this plan is but little increased, and it manifestly facilitates the setting of them to the gauge required.

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2. For an improved mode of *Handling Hides in the Tan Vat;* Samuel Stem, and Daniel Wireman, Mechanic's Town, Frederick county, Maryland, January 9.

A frame is made of nearly the length and width of the vat into which it is to go, and capable of being readily raised or lowered. Along each end of the frame, on its upper side, pins are placed, at regular distances from each other, for the purpose of suspending the leather which is to be tanned. This frame has a piece of timber

crossing from side to side, at the middle part of it, to receive the action of the lever by which the handling is to be effected. The fulcrum of this lever is an axle, or shaft, extending across the vat, and having a wheel at each end to facilitate the moving of it, which wheels rest on cap timbers, or ways, on each side of the vat. The short end of the lever is attached by a jointed rod to the cross timbers on the frame, and when the long end is pressed upon, the frame will be raised. By making the frame somewhat shorter, or narrower, than the vat, a longitudinal, or lateral, motion may be given to it; or, if desired, it may be readily so contrived as to cause it to vibrate, or rock.

The claim is to the handling of hides by the apparatus, or combination of machinery, above described.

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3. For *Substituting common Grindstones for the Rubbers in Smut and Hulling Machines;* Bartholomew Smith, Bethlehem, Albany county, New York, January 9.

It is not proposed to confine the use of grindstones to machinery of any particular form, but to adapt them to such as is well known, and of various constructions. These stones, it is said, possess many advantages over the cast iron, and other rubbers and hullers. Among them are, their not being subject to glaze, their operating more perfectly, their capacity of being used at a greater distance from each other, and thus preserving the grain unbroken, their cheapness and their durability.

There is another point of much importance to the patentee, and that is, the novelty of the invention, or application. We do not know that common grindstones have been named in any of the patents previously obtained, but we do know that sand stones, or stones having a sharp grit, have been spoken of as employed for such purposes, and this, at all events, is touching the grindstone very closely. Common mill stones, and those with a mill stone grit, have also been extensively used, and this, too, is very much like using grindstones.

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4. For *India Rubber Hose for Fire Engines, &c.;* Edwin M. Chaffee, Roxbury, Norfolk county, Massachusetts, January 9.

Linen or cotton duck is to be coated on both sides with a solution of caoutchouc, and suffered to become nearly dry. It is then laid upon a table, and folded over so as to form a tube, or hose, of the required diameter; the folding, or rolling, being continued so far only as shall cause the cloth to be double for about half the circumference of the hose. Each end of it is then to be completely stopped with a block of wood, one of the blocks being perforated, so that by means of a condensing, or force, pump, air, or water, may be forced into, and made to distend the tube; when this has been done, the rolling is to be continued until three, four, or any required number of thicknesses of the prepared cloth have been united together. The surface is to be moistened with a solution of the India rubber, and care taken that the juncture is perfect in every part, all air, &c. being carefully excluded.

The "claim is to the use of air, water, or other fluid, for the above

purpose, and to the hose that shall be constructed in the mode above described."

We do not think it quite correct to claim the mode of manufacturing, and also the article manufactured, provided the latter does not differ from such as is made by other methods. If the article itself is a new manufacture, it is patentable; but if I invent a new machine for cutting nails, which nails are not distinguishable from those made by other machines, I should think it at least superfluous to claim both the machine, and the nails cut by it. This claim, it is true, may be mere surplusage, and so we think it, in which case it will not vitiate the patent; but in obtaining a monopoly, it is best to be careful to leave as little as possible for the gentlemen of the long robe to talk about; every claim made, which is not clear, distinct, and characteristic, tends to embarrassment, and is, therefore, best avoided.

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5. For a *Riddle, or Rotator, for separating Ashes from Coal;* John J. Glen, city of Philadelphia, January 9.

The Rotator is represented as composing a circle of grate bars, united together by a hoop, or ring. The grate, however, is divided into two parts, by bars which cross, and unite the other bars, about the middle of the circle. The object of this is to hang one half the grate upon pivots, so that when a pin which supports it is withdrawn, the half so hung will fall, and discharge the coals into the ash pit. The whole circle is supported by having a conical cavity on its under side, resting upon a projecting pin, thus allowing a vibrating, rotary motion to be given to the whole, by means of a projecting handle. The centre cap makes a part of the unhinged half of the grate. The rotary movement constitutes the claim.

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6. For a *Weathercock Wheel,* to carry every kind of machinery by wind, or water. Nathan T. Davis, Wilmington, Windham county, Vermont, January 9.

This machine is intended to be one of no ordinary character, as it is "to carry any and every kind of machinery by wind or water; also to propel boats and every other kind of water craft by wind," an article much cheaper than wood or coal, whilst the apparatus through which it is to operate will also be much less costly than a steam engine.

The weathercock wheel, when acted on by wind, (as weathercocks usually are,) is, in fact, a vertical wind mill, having four sails, which are quadrangular, and turn upon gudgeons in suitable arms; the gudgeons not being placed in the middle of the upper and lower edges of the sails, but nearer to one end than to the other, that the wind may always direct them in one way. There is a stop, or button, upon the arms, to hold the sail when under the action of the wind, and there are ropes leading from their ends to the vertical shaft, to govern their motion.

In what particular all this differs from many other vertical wind mills, we do not know, and are not likely to learn.

A wheel made in the same way is to be placed in the tide, or cur-

rent, of a river, where it will run as well, and do as much work as many similar wheels have done before it; and why it should do more we know not, as it is exactly like them. In several instances they have certainly answered as well as we have led the proposers of them to anticipate, but still, this has been so badly, that they have been all thrown by as useless. The patentee, no doubt, prophecies more favourably of the one before us, or rather, did so in January last; if, however, he has been working, or labouring, with it ever since, he has encountered unexpected difficulties, which will not be easily overcome, as they are inherent, and therefore, like chronic complaints, very obstinate in their character.

This wheel, however, is destined, or rather designed to perform a more noble office than that of a mere wind and water wheel; it is to propel boats, and thus take the place of the steam engine. The said vertical wind wheel is to be placed within the boat, and geared to the paddle wheels; when, should every thing operate as intended, the boat will be thereby propelled. Even here, unfortunately, if a worthless contrivance can be called unfortunate, the invention is not new; it has been proposed hundreds of times, and even patented more than once. Those who cannot perceive the utter futility of such a plan, have more to learn than we can attempt to teach them.

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7. For *Preventing the waste of Heat in Cook Stoves; applicable to other purposes;* Eliphalet Nott, Schenectady, New York, January 9.

(See specifications.)

8, For a *Machine for Grinding Corn;* Thomas Briggs, Bloomfield, Ontario county, New York, January 10.

Here we have an iron cylinder, which may be one foot in diameter, and four inches in length, along which teeth are to be formed, or cutting knives placed, extending from end to end. An iron, or a steel, concave, furnished also with teeth, is placed so that its lower edge shall be nearly in contact with the cylinder, and the corn to be ground, being placed in a hopper above, passes down between the cylinder and concave, and, as the cylinder is made to revolve, is acted upon by the teeth, or knives. There is, of course, to be a suitable frame, properly enclosed, and the necessary provision for turning the cylinder.

Such a machine, we should suppose, might serve to make hominy, by breaking the corn, but so far as grinding is concerned it is rather an unpromising affair. The patentee has not pointed out its merits, or preferred any claim.

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9. For *A Vice;* James Long, Harrison county, Virginia, January 10.

This is a wooden vice, denominated by the patentee the "Superior Vice," and since there is no standard given by which to judge, and there are undoubtedly some which are inferior to it, the name

need not be objected to. It is to be tightened by a wedge, and is to be used by wheelwrights, coach-makers, joiners, &c., instead of that usually tightened by a screw. Like other wooden vices, it has two upright jaws, one of which is to be made fast to the bench, whilst the other works upon a joint at its lower end; this, which is the front jaw, has a mortise through it at the part usually appropriated to the screw; and a long tenon, which is firmly attached to the back jaw, passes loosely through this mortise, and receives wedges which tighten the jaw, or cheek.

When the wedge is to be removed the jaw is opened by placing the foot upon a treadle at its lower end, which, when pressed down, bears against a friction roller in the back jaw. A spring is so fixed as to close it when the foot is taken off the treadle. We are told that by facing the inside of the jaws with steel, this will be found to be a very cheap and useful vice for a blacksmith; there are, however, but few blacksmiths, we believe, who would be willing to use it, if they could procure one of iron.

The patentee sets forth the good qualities of his invention very much at large, but as its construction will be easily understood, we leave it to tell its own tale.

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10. For an improvement in the *Surveyor's Compass;* William J. Young, city of Philadelphia. First patented January 17, 1832. Patent surrendered and reissued January 11.

The patentee states that in the former specification he was, by inadvertence, made to claim as a part of his improvement, "the principle of measuring horizontal angles without the aid of the magnetic needle; which it was never his intention to claim, the same having been known for several hundred years, as a constituent part of the Theodolite."

The invention was duly noticed in our remarks on the patent issued in January, 1832, to which we refer; the only difference in the specifications being the omission of the claim above noticed.

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11. For improvements in the *Machinery for Spinning Rope and Duck Twine.* Granted to James Long of Greenock, Scotland, agreeably to a special act passed July 3, 1832. Issued January 16.

(See specifications.)

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12. For a mode of *Preserving the Shingles used for covering houses;* Foster Henshaw, Brookfield, Worcester county, Massachusetts, January 16.

Tar is to be poured into a suitable kettle, and about one-fourth part of turpentine is to be added. The mixture is to be brought to a scalding heat, when the shingles are to be dipped into it, and the two sides then placed upon sand which has been sifted, and made hot, that the grains may sink the more perfectly into the tar.

How much of novelty there may be in this we cannot tell precise-

ly, but we know that the amount is not large; the dipping of shingles into heated tar, has been frequently practiced, and the covering them with hot sand, after they were laid on the roof, has also been done. We doubt the utility of adding the turpentine to the tar, the latter being itself composed in a great measure of this article.

The claim is to "the application of the foregoing composition to shingles, employed in covering buildings." This claim would certainly include the application after, as well as before, the laying of the shingles.

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13. For a machine for *Mortising Window Sash;* Orin Ellis, Orange, Franklin county, Massachusetts, January 16.

A very imperfect description is given of this machine, although by its aid, and that of the drawing, we can form a tolerable idea of its general construction. The strips to be mortised are placed upon a suitable bench, or table, from which rises, perpendicularly, a standard, that sustains the chisel, and the pieces which are to serve as sockets, or guides, for it to slide in. A lever is fixed in the manner of a treadle, near to the lower part of the table, and the chisel is forced up and down by its aid; a pitman, or sliding rod, extending from it for that purpose. The lever is raised by means of a spring, and forced down by any adequate power.

The chisel is to be made in four pieces, so bent at their lower ends that they shall, combinedly, form a socket of the size of the mortise to be made, the whole four sides of it being cut by them at once, whilst there is a punch, or clearer, so fixed as to force out the chips.

"What is claimed as an invention, is, the square chisel set in a stock, and having a punch, or clearer, operating within the same, for mortising window sashes." There are several patents for mortising with chisels in the form of a square socket, but we believe they are all in one solid piece. To form such a tool of four pieces, to cut so as not to admit chips in the joining angles, will be a thing of some difficulty.

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14. For a *Washing Machine;* William Miller, and Ezra Rogers, Connersville, Fayette county, Indiana, January 17.

A cylinder, having its periphery covered with flutes, or rounds, is to be placed in a trough, its gudgeons bearing against springs which allow it to rise. There is a hollow, or concave, in the lower side of the trough, furnished with rollers from end to end; between these and the main cylinder the clothes are to pass, by giving an alternate motion, backward and forward, to the latter.—We do not look for novelty in washing machines.

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15. For a *Cylindrical Flyer, and a Step for Spinning Machines;* Samuel P. Mason, Killingly, Windham county, Connecticut, January 17.

The flyer here patented consists of a cylindrical ferule, or barrel, of metal, sufficiently long and wide to admit the spool upon which

the spun material is to be wound. The upper end of this cylinder is open, and has pins, or notches, on its edge, to guide the thread; the lower end of it is closed, and has affixed to it, by soldering or otherwise, a hollow steel or iron spindle, which receives a whirl, and allows the main spindle, that supports the bobbin, to traverse up and down within it. The hollow spindle has, of course, a suitable step and collar, to support it as it revolves, with its cylindrical flyer.

The advantage proposed by the adoption of this spindle, is the getting rid of the resistance of the atmosphere, and the consequent accelerated motion which may be given to it. The only part considered new is the flyer, as described.

As regards the getting rid of the resistance of the atmosphere, we see but little difference between this and the can spinner patented by John Thorp, November 20th, 1828, (vol. iv. p. 65.) In the foregoing patent, the can is inverted, and is operated upon in a different, and perhaps in a better way, than in Thorp's machine, but still, in the point alluded to, they appear to be similar.

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16. For a *Clover and Rice Hulling Machine;* James W. Mathews, and Matthew S. Kahle, Lexington, Rockbridge county, Virginia, January 17.

Although this machine is the production of the combined talents of two inventors, they have not been so happy as to strike out any thing that is new; the cleaning, or hulling, being effected by their instrument in precisely the same way in which it has been done by many others. The grain, or seed, is to be subjected to the action of one or two cylinders with their concaves. When there are two cylinders, the upper one, made of wood, is to be surrounded by punched sheet iron, or covered with emery, wire, pins, &c., the concave being similarly coated, or covered: the seed is to fall from this to the second cylinder and concave, covered with shark skin, sole leather, powdered emery, sand, glass, or any other gritty substance, where it is again rubbed, and falling thence, is acted upon by a fan wheel of the usual construction.

The invention claimed consists in the peculiar construction of this machine, and in the arrangement and combination of its several parts.

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17. For an improvement in the *Art of Cutting Garments;* James H. Chappell, Chilicothe, Ross county, Ohio, January 18.

We are referred in the specification of this patent "*Spherical System*," to a printed book, containing directions on each end of the cover; and which is also to be used for recording measures. Not having seen the printed book, and being, therefore, without even the ordinary guide of reviewers, the printed title, we are unable to report upon it; those who are adepts in this business, however, will, undoubtedly, obtain the work, and possess themselves of all desired information on the subject. Although the specification does not tell us what the system is, it furnishes some information respecting what

it is not. This system is not, like its predecessors, "based upon the divisions of the breast, waist, or height, of a person," "but has its base from whole measures taken from a point of the body at right angles in front and bottom, of arm hole, or scye; for further particulars see explanations for measuring and drafting coats," which we suppose forms a part of the subject of the said volume, or Sibyline leaves.

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18. For *Making Isinglass, or Icthyocolla;* William Norwood, John Burns, Jabez Rowe, and Josiah Haskell, Gloucester, Essex county, Massachusetts, January 21.

The whole specification of this invention, or discovery, does not greatly exceed in length the catalogue, or list of the names of the parties concerned in its elaboration. We are told to take the sounds of the fish, (cod fish, we suppose,) to clean them from all blood, and fleshy particles, dry them, soak them in fresh water, and then to pass them through a machine consisting of a roller, or of knives, to divide them into small pieces; then to mash them to a paste between iron rollers, continuing to roll it until it forms long ribbon-like strips, which are to be dryed. The claim is to the cutting the material into fine pieces, breaking it into paste, and running it into strips.

The sounds of cod, as well as those of several other kinds of fish, consist principally of gelatin, which is in its nature identical with the icthyocolla obtained from several species of sturgeon.

We do not perceive the advantage of treating the sounds in the way proposed by the patentees, as the nature of the article will not be altered by mechanically destroying its fibrous texture. The manipulation to which it is subjected must render it more costly than when merely cleaned and dried, and should it even give to it an improved appearance, this alone is not the kind of improvement for which the law contemplates the granting a monopoly; there ought also to be in the discovery, or invention, some real utility—something to benefit the public. How much each of the individuals concerned in taking out the patent, contributed towards this invention, or discovery, it might be difficult to tell, but to entitle them to it they must each be "true inventors or discoverors."

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19. For a *Machine for Tonguing, Grooving, and Planing Boards*, for flooring, and other purposes; John D. Bears, city of Philadelphia, January 18.

The planing, tonguing, and grooving, effected by this machine is, almost exclusively, done by circular saws; in most instances, the application of these is sufficiently plain, although the specification is not very clearly drawn up, and the drawing not well executed.

The planing is to be effected by a circular saw, having teeth on its rim, their edges being in the plane of the wheel, like the teeth upon a crown wheel. These teeth, when sharp, will, it is said, render the face of a board quite smooth; but, in addition to them, knives, or cut-

ters, are attached to the arms of the wheel, like those sometimes used in straw cutting machines, the edges of these knives being either straight or curved, and projecting a little beyond the teeth which are on the periphery. The board to be planed is passed between rollers, two of which have projecting teeth, or pins, to take hold of it, and cause it to advance. The planing wheel operates upon the under side of the board, so that the shavings fall down as fast as they are taken off.

The grooving and tonguing, is to be effected entirely by circular saws, some of which work vertically, and others horizontally, according to the purpose which they are intended to answer. The grooving may be effected by three circular saws, following each other, each of them rather more than one-third of the width of the groove in thickness, so that they may overlap each other, and cut the groove clean.

The patentee claims "the application of circular saws for tongueing, grooving, and trimming boards. The application of circular saws for reducing to a thickness, and planing boards for flooring and other purposes, also the application of planing, or shaving irons, in the mode, and for the purposes herein described. The application of wheels with points projecting beyond their peripheries, to move the board, or plank, through the machine."

At p. 120 of the last volume, there is described a machine for planing, tonguing, and grooving, patented on the 28th of August, 1833, in which the jointing, tonguing, and grooving, are all proposed to be effected in precisely the same way with that now claimed. On examining the remarks made upon that patent, it will be seen that we did not then deem the plan to be essentially new; in the other parts we think there is sufficient novelty.

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20. For an improvement on the machine invented by Daniel Toms for *Sawing Staves;* Jesse J. Smith, and John Rice, jr., Cayuga county, New York, January 21.

The machine upon which this claims to be an improvement, was patented by Mr. D. Toms, of Auburn, Cayuga county, New York, March 2, 1830, and is described at p. 361, vol. v. The present patentees describe the whole machine, which, in its essential features, remains unchanged; what they claim as invented by them consisting in variations in the manner of gearing, and regulating the action of it, as will be seen by the following quotation. "The lever-dogs, the cog, and rag, and spur wheels, with the slides for moving and holding the log on the head block; the combined levers, and the spring with its rod, and the angular piece which lifts the lever on the spring, all for the purpose of throwing the pinion in and out of gear with the carriage rack, we claim as altogether our own construction and invention."

It is to be presumed, that this patent is obtained with the concurrence of the original patentee, as, otherwise, the improvements, however valuable, will not enable the improvers to use the machine. As

regards the present claims, however, they are necessarily restricted to the particular mode of gearing described, and however good and convenient this may be, it is not to be supposed that there would be much difficulty in divising others equally so.

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21. For an improvement in the *Construction of Canals, and in certain machinery whereby boats may be propelled on the said canals, or on other waters, &c;* Charles Bonnycastle, University, Albemarle county, Virginia, January 21.

This improvement in canals relates entirely to the constructing within them an apparatus to be connected with some motive power, usually a steam engine, by which boats may be propelled thereon.

A rail, resembling Palmer's single rail for rail-roads, is to be constructed along the middle of the canal; it may be even with, or elevated to any convenient height above, the surface of the water. This rail is to be surmounted by one of iron, which is to be acted upon by the power employed to propel the boats. These boats are intended to be long and narrow, as they are to go two abreast, one on each side of the rail; a train of them is to be connected together, the two foremost of them carrying the steam engine, or other motor. Two wheels, which may be of the size usually employed upon rail-roads, are made to revolve horizontally against the opposite sides of the rail, embracing it between them, they, by a suitable contrivance, being made to press against it, so that by their friction the locomotion may be effected.

The boats on the opposite sides of the rail, are to be connected together by suitable straps which pass over it, and their stems and sterns are so constructed and adapted to each other, that whilst they are allowed to have play enough to turn round curves, they may operate, as nearly as possible, like one continuous boat.

The advantages anticipated from the foregoing construction are the following.

1st. The application of steam, or other power, for propelling boats upon canals, or other waters, where it is not now employed, because the action of paddle wheels would be destructive to the banks.

2nd. The keeping in a certain line, by means of the rail, admitting of a great increase in the length of the chain, or train, of boats; their width and depth being diminished in proportion, whereby the resistance, and the consequent washing of the canal, are greatly decreased.

3d. The using of short boats, whereby a long chain of them will be enabled to turn on such curves as are common on canals; and also to allow them to pass over inclined planes.

In passing over inclined planes, wheels, with trucks, such as are now employed, or others which may be found convenient, are to be used, locomotive or fixed engines being employed. The claim is in the following words:—

"What I claim as my invention, and for which I solicit letters patent, is the use of one or more rail-ways elevated above the sur-

faces of canals, rivers, lakes, or other waters, or placed at small distances below those surfaces; the word surface herein designating the surface of the water. Also, the use of such method of connecting boats as that herein described. And, also, the use of a motor, having wheels clasping a rail, and detached from the locomotive engine. And I do especially claim to myself the right of using this motion for propelling boats, barges, or other vessels, along canals, rivers, lakes, or other waters. I claim, and do reserve to myself, the right to use a locomotive engine, traversing on one or more rails raised above the water, or placed at small distances below it; such engine being propelled, if necessary, by the adhesion of its own wheels."

Various contrivances have been made for applying the motive power on board of steam-boats otherwise than by paddle wheels; as, for example, by a chain, or rope, along the canal; by wheels acting upon the bottom, or upon the tow path, and by logs lying along the middle, having racks upon them, into which a toothed wheel might work; the present plan we believe to be new, and the main, if not the only difficulty in the way of its adoption, is that the canal and boats must be constructed exclusively with a view to it.

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22. For an improvement on the *Mode of fixing Valves on the Boilers of Steam Engines;* David B. Lee, city of Philadelphia, January 23.

The safety valve here patented is, we are informed, "a fixture for boilers for steam engines, to prevent *collapsation*, resembling the common safety valve, except that it opens in by the pressure of the atmosphere." And "the part claimed as an invention, or discovery, is, not the particular form of the valve, but the general plan of fixing a valve, or valves, to boilers of steam engines, which shall open with an external pressure, to prevent collapsation."

A very little reading would have shown to the patentee the antiquity of his invention, as an account of it may be found in most, if not in all, of the numerous histories of the steam engine. We could take from our shelves a dozen books from which to quote upon this point, and could refer to numerous patents in which such valves are noticed. In the article STEAM ENGINE, in Rees' Cyclopædia, after speaking of the safety valve in Watt's engine, it is observed, that "There is another valve of safety, for the reverse of the object of the first mentioned safety valve; it opens internally, and is balanced by a small lever, and a sufficient weight to keep it shut, until the pressure of steam within the boiler becomes much less than the external air, which then forces open the valve, and enters into the boiler till the equilibrium is restored. It is evident that this valve can never be necessary so long as the engine is at work; but its use is to prevent the sides of the boiler being crushed in by the weight of the air, when it has done work, and the steam within it cools and condenses."

This kind of valve, has, in fact, been applied to hundreds of boilers, stills, &c. With the kind of boilers which we now ordinarily use in steam engines, valves of this kind are not employed, for the

simple reason that they would be of no use. Our cylindrical iron boilers do not collapse by the pressure of the atmosphere, which they would be able to sustain even if perfectly exhausted; nor is the collapsing which frequently takes place, a collapse of the boiler, as the patentee appears to suppose, but of that of the flue which passes through it, and which is forced in, not by the pressure of the atmosphere, but by that of high steam, occasioned, in general, by the water being allowed to descend too low, which admits of the heating of the upper part of the flue, and the consequent diminution of its strength; it then yields readily to a pressure which, under ordinary circumstances, it would have sustained most effectually.

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23. For an *Apple Grinder and Corn Sheller;* Moses Morehead, Butler county, Ohio, January 23.

This apple grinder and corn sheller is made very much in the form of the ordinary cast-iron bark mill, but the shell, or tub, and the nut also, are made of wood, having on the inside of the former, and the outside of the latter, strips, or bars, of wrought iron. And the improvement is said to consist in "the iron bars which are screwed to the tub, and cylinder, and in the application of the machine to grinding apples and shelling Indian corn."

This machine will not, we are well convinced, accomplish either of the purposes to which it is intended to be applied, nearly as well as the ordinary machines now in use. The shelling of corn should be effected without the breaking of the cob, and a machine which will allow the latter to pass through will not reduce apples to the state of pommage.

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24. For an improved *Hat Block, for colouring and cooling Hats;* Richard Pike, Wilton, Fairfield county, Connecticut, January 23.

The hat block here patented instead of being made out of solid stuff, in the usual way, is to be formed by framing wood together so that a large portion of the surface of the block shall be open, and admit the air and colouring matter freely to the inside. The surface of the block may, if desired, be covered with thin wood or metal, which is then to be perforated with numerous small holes. By this arrangement the colouring and cooling are both facilitated, are better performed, and at less expense than by the old mode. The claims are to "the open framed cylinder block, and the perforated covering thereon."

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25. For a *Machine for Cutting Sausage Meat*; Daniel S. Middlekauff, Hagerstown, Washington county, Maryland, January 23.

The meat is to be placed upon a circular plank, or block, which is to be made to revolve slowly by the turning of a winch, which at the same time gives motion to a horizontal shaft having cams, or lifters, upon it, that raise a row of wooden springs, to each of which is attach-

ed a knife, or chopper. The claim made is to "the particular arrangement of the several parts of the machine before described, for cutting sausage meat." To what particulars this claim refers, we are unable to say, unless the intention is the exact form and manner of constructing the parts, as we perceive nothing in the principle or operation of the machine which has the slightest claim to novelty.

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26. For a *Machine for Cutting Sausage Meat;* Jacob Fahrney, Quincy, Franklin county, Pennsylvania, January 23.

A semicircular, concave trough is to be made of wood, and within this is to be fixed a row of knives, placed near to each other. A cylinder of wood, carrying knives which pass between those fixed in the concave is to revolve by means of a crank. A trough, or hopper, to receive the meat to be cut, surmounts this apparatus, and a comb placed on the ascending side of the revolving knives, or wings, serves to clean them, and to prevent the meat from being carried round by them.

The apparatus is but very indifferently represented in the drawing; the claim is to the wings stationed in the cylinder; the improvement of the cuts in the wings by which the meat is pushed through the knives; and the comb, with its operation of cleaning the wings, with the additional knife on it. The defectiveness of the drawing prevents our ascertaining what is intended by a part of these claims, although the general operation of the machine is sufficiently obvious.

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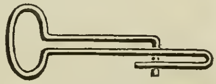
27. For a *Hook by which the Bits may be attached to Bridles, and other parts of Harness be connected together;* Asahel A. Hotchkins, and Ebenezer Garnsey, Sharon, Litchfield county, Connecticut, January 23.



This contrivance is designed to connect the several parts of the harness without the use of buckles, or such other fastenings as are now employed for that purpose. A piece of wire is to be bent in the form shown by the sketch in the margin; one end of this is to be attached to the reins, or harness, and the other, or hook end to the bit, or other part. The two ends of the wire thus bent forming a hook, and a spring, to prevent the slipping out of the bit, &c. The advantages are said to be cheapness, and perfect security; and the claim is to a fastening thus made of one piece of metal, instead of two or more pieces.

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28. For a *Lever Power, by which both power and velocity are gained;* Tyler W. Lafetra, city of New York, January 23.

Upon reading the title of this patent we came at once to the conclusion, that, whatever might be the form of the apparatus, it would, should its construction and application be prosecuted with zeal by the patentee, possess the power of exhausting his purse with considerable velocity, and in this way more than justify his anticipations. When

a man, ignorant of the first principles of mechanics, has turned a well-hung grindstone with considerable velocity, he is very apt to conclude that he has discovered a power hitherto unappreciated; and such is the discovery now before us, excepting that instead of the two simple gudgeons of the grindstone, there are to be at least thirty rubbing parts, each of which is to assist in the gaining of power.

Most of our readers, we suppose, know what is intended by "lazy tongs," which consist of a number of ×, or scissor-formed joints, connected together; it is by the application of an apparatus of this description that power and velocity are to be gained. A heavy fly wheel is to be suspended upon gudgeons, and is to have a pinion upon its axis; a cog wheel is to gear into this pinion, having a crank upon its shaft, which is to be driven by a shackle bar, or pitman; an alternating motion is to be given to the pitman by working a lever, like a pump handle. The merit of the contrivance resides in the pitman, which is constructed with joints in the manner of the lazy tongs; the lever, however, ought not to be worked by a lazy man, or he will expend his labour, and have but little to show for it. It is true that in this opinion we differ very much from the patentee, who contemplates the applying of his "contracting and expanding pitman at the end of a lever beam of a steam engine, to rail-road cars or carriages, operated upon by steam, and, in fine, to all machinery wherever lever power can be employed." Perhaps, however, there may be a more perfect agreement between us now than there would have been at the time of obtaining the patent, six months ago; that this is the case, we have not the slightest doubt, provided he has fairly tried the experiment of putting his contrivance into practical operation.

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29. For improvements in the *Construction of Wagons and other Wheeled Vehicles;* Elijah Brown, Stockbridge, Berkshire county, Massachusetts, January 23.

There are several things claimed as improvements in this patent, some of which are certainly not new, however useful they may be. The axle which enters the wheel is not to be regularly tapered, but is to be cylindrical for three or more inches towards the shoulder, and is also to be cylindrical, but of a lesser diameter, towards the lynch-pin. The box within the hub is to be in contact with it at the cylindrical parts only. The wheels are to revolve perpendicularly, the axle not being bent, as for dished wheels.

A metallic rod is to be inserted along the centre of the wooden axle, and secured in it by a key at the back end, the front being tapped to receive a nut.

Metallic cylinders, with wings to secure them, are to be driven on to the wooden axle, to form the cylindrical bearings.

The arms of the crotch are to be widened out, so as to be inserted into the hind axles as near as may be to the wheels, and it is to terminate in front as near as possible to the fore axle omitting the common reach.

The tongue is to extend through the hounds so that its end may

come into contact with the fore axle, where it is to be allowed to work up and down between metallic plates.

Tube plates (metal tubes, we suppose,) are to be inserted in all parts liable to be worn by a pin.—All these things are claimed.

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30. For an improvement in *Hanging Bells;* Joseph Carrier, city of Boston, January 23.

At p. 403 of the last volume, we gave an account of a patent for hanging house bells, obtained by a citizen of Boston on the 26th of December last; between that and the present plan there is a considerable degree of resemblance, although they are not by any means identical. The hemispherical clock bell, which made a part of the claim in the former patent, is the kind used in the present instance. It is to be furnished with two hammers, striking it on opposite sides, and the tails of these are to be tripped by the cams projecting from a slide, which is acted upon by the bell wire, and a spiral spring. The same bell is to serve for a number of apartments, their wires being all connected to a kind of lever which acts upon the slide with its cams, and each wire having suspended from it, a number, or token, which shows, by its vibration, the wire which has been pulled. The specification is written with much clearness, and with the aid of the drawing presents the apparatus patented very distinctly before us. The claim is to "the construction, combination, and adjustment of the said machinery, for producing the desired effect."

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31. For *Preparing and Leaching Ashes, and making Potash;* Ephraim Parce, Chenango county, New York. Patented July 20, 1831. Patent surrendered and reissued upon an amended specification, January 23.

In vol. ix. p. 48, we gave an abstract of the original specification, and as the new one differs much from it in its form, we shall proceed with that in the same way.

The improved mode of making potash is said to consist of two parts. First, in applying lime and salt dissolved in water, at a boiling heat, to crude ashes. These agents, it is stated, have both been previously employed, but not at a boiling heat, and it is in this that the improvement in part consists. The mixture may be made in different ways, but the mode preferred is the combining the lime and salt in proper proportions, dissolving and pouring them on the ashes at a boiling heat. Fifteen pounds of salt, one bushel of lime, and eighty gallons of water may be used with twenty bushels of common house ashes; but these proportions admit of considerable variation.

The ashes being thus prepared the second part of the process commences; this consists in the pouring cold water upon the ashes thus prepared, which will leach them more effectually than has been heretofore done.

The directions given for carrying the process into effect, are as follows:—

With twenty bushels of ashes, prepare the leaches with lime bot-

toms in the usual way; bring the salt and water to nearly a boiling heat, and then add to it the bushel of unslaked lime, which will immediately cause it to boil. Upon the first layer of ashes, which may be four inches deep, pour as much of the heated mixture as will thoroughly scald it; go on thus with fresh proportions until the whole of the ashes are thus scalded. With field ashes the salt is to be reduced one-half, and the lime increased one-fourth. The ashes are to be covered with cold water until it rise two inches above them, and kept so covered until they are exhausted, which will require eight or ten hours. The boiling and melting are then to be proceeded in.

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32. For *Making Scythes*; Abel Symonds, Fitchburg, Worcester county, Massachusetts, January 23.

The scythes are to be of the kind called "the concave set scythe, and the thing patented is the mode of giving the concavity to the web of the scythe. The description is very imperfect, but the apparatus appears to consist of a pair of swages, or *faces*, one of them concave, and the other convex. The concave face is to be fixed in an anvil stock, and the convex face in a trip hammer. The parts claimed are the above faces only.

We know not in what way the concavity is usually given to such scythes, but so many articles are formed by means analogous to that described; we should not think, therefore, that the application proposed was a patentable affair.

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33. For an improvement in *Tanning;* Walter Russell, Ashburnham, Worcester county, Massachusetts, January 23.

The skins are to be raised one-fourth more in the lime than they would bear in the common drench, and they are then to be rinced clean and fleshed; after this, immerse them in warm water, and, on taking them from this, work them carefully on both sides with a fleshing knife; they are then prepared for the following liquor.

Into about thirty gallons of water put as much salt as it will dissolve; add two pounds of sulphuric acid, stirring it well. This will suffice for fifty sheep skins; immerse twenty-five of these at a time in the liquor, allowing them to remain therein about an hour; then take them out, let them drain, and immerse them, one at a time, in water as hot as the hand will bear, rincing and withdrawing them quickly; the liquor is then to be squeezed out on a table by means of a *slicker*. Having prepared a sufficient number of skins in this way, immerce them for an hour in sumack liquor, of the usual strength;—squeeze out the liquor on a table, as before, put them into the liquor again, and the tanning will be completed in a few hours. If bark liquor is used, a small quantity of salt is to be added to it.

A note bene is added, informing us that skins so tanned save one-fourth in the process, and bring twelve per cent. more in the market than others.

34. For an improvement in *Stoves*; John G. Treadwell, Albany, New York, January 23.

There are said to be two improvements in the stove included in this patent; the first of them consists in making the bottom of the oven of two plates, placing them at such distance apart as may be found convenient, and allowing the heated air in its passage to the flue, to pass between them. This, we are told, will equalize the heat, and preserve the bottom of the oven from a rapid decay. The second improvement consists in the substituting of two cast iron rotary dampers for the sliding dampers now in use. These rotary dampers are to have a cast iron handle, but in what they differ from other rotary dampers we are not told, the thing being spoken of as though rotary dampers were entirely new to the world; whilst they are so common, that if they were unknown to the patentee, one might be ready to suppose that he had lived out of it. We have sometimes seen stoves with two ovens, one above the other, the fire circulating round them; in this case there was necessarily a double bottom to the upper oven, the top plate of the lower oven forming one of them.

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35. For an improvement in the art of *Manufacturing Pumps;* Dudley L. Farnham, city of Philadelphia, January 24.

The water pumps to which the improvement now patented applies are two, first, Rountree's, which is applied to a fire engine, and is described in many works on mechanical science; the specification refers to that in the American edition of Nicholson's mechanics, vol. ii. p. 282. The second is a very similar pump patented by John F. Rodgers, of Waterford, New York, in February, 1833.

In the ordinary way of making these pumps, there is much nice work to be performed, and the present patent is taken for the construction of moulds in which the chambers, and other parts, are to be cast, so as to obviate the necessity of turning, or any other operation to insure their truth. They are to be cast of an alloy of three parts of zinc, and one of block tin, or of some similar compound, in moulds of iron or brass, requiring only the removal of the sprue from the cast segments, and the cleaning and soldering of the edges where they are to be joined. When the moulds are of brass, they must be heated before casting in them, and rubbed with sulphur, keeping them hot enough to burn the sulphur off. If of iron, the outside pieces must be smoked; and where a core piece, or plug, is used, it must be rubbed with soap once in every three or four castings; these cores also require to be driven out as soon as the metal is set, or it will crack by contracting upon them. We mention these points, which are noticed in the specification, not because they are unknown to the adept, but because they may be useful to those to whom they are new.

Drawings are given of the mode of constructing the several moulds, and a claim is made to the "plan of manufacturing pumps as applied to the two kinds described in this specification, by casting them in parts in models [moulds] perfectly finished, and so formed that the

different parts may be easily put together by soldering and bolts; thereby greatly lessening the expense of manufacturing."

A long description is given of the construction of the pumps, which, as they make no part of the patent, is mere surplusage; the moulds are very well represented in the drawings; but such moulds, for various purposes, are so well known, that it seems doubtful whether they are proper subjects for a patent.

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36. For a *Water Table* for outer doors; John Burt, jr., Tiverton, Newport county, Rhode Island, January 24.

Many plans have been devised for water tables, and for causing doors to close at the bottom, and to open readily over carpets, but few, if any of them, however, have continued in use. So far as we can judge of the plan now proposed, it does not offer any thing superior to what was before known. The description, however, is far from clear, even with the aid of the drawing, and we should probably fail in any attempt to make it so.

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37. For an improvement in the mode of *Dressing Woollen Cloth*, and cloth part wool and part cotton; Calvin W. Cook, Lowell, in the county of Middlesex, Massachusetts. Patented May 20, 1833. Patent surrendered and reissued on an amended specification, January 25.

In our list of patents, vol. xii. p. 320, we observed that the patentee was making trial of his machine, with a view to render its operation more perfect; in doing this it appears that he discovered his specification to be in some points defective, and that he has, in consequence, put in a new one, more clear and full than the former, although the machine is essentially the same, and the claims made in nearly the same terms.

Two hollow cylinders of copper, of about six inches in diameter, and of such length as may be requisite, are to be placed in a frame in which they may be situated like the ordinary wooden rollers of a gig mill, serving to wind the cloth on, from one to the other; one of the gudgeons of each of these cylinders is to be hollow, to admit steam, and their surfaces are to be perforated with holes of about one-eighth of an inch in diameter, and an inch apart. Before winding the woollen cloth upon these cylinders, they are to be covered by a number of yards of linen or cotton cloth, to prevent the too direct action of the steam, and to distribute it more perfectly as it comes into contact with the woollen fabric. The cloth to be dressed is attached by its two ends to the cotton, or linen, on the rollers, and is to be acted upon by teazles, or otherwise, to lay the nap correctly; and when this has been done the steam is to be admitted into the cylinder upon which the cloth was last wound, so as to pervade it entirely, the cylinders, in the mean time, being kept in motion. The steam may be allowed to act for about twenty minutes, when the operation of gigging may be repeated, and the steam afterwards applied in the steam cylinder for the same length of time. One cylinder, it is observed, may be

made to answer the purpose, although not so perfectly as two, and other modifications of the process are mentioned as being included in the general principle.

The machinery, in the form most approved for performing the operation, is described in the specification, and clearly represented in the drawing; but as the patent is not taken for this particular mode of construction, and as there cannot be any difficulty whatever in understanding the nature of it from what has been already said, we shall do no more than subjoin the claim.

"What I claim as new, and as my invention, is the application and use of such hollow perforated metallic cylinders as aforesaid, in the ways and manner used for the purposes aforesaid, and the applying of steam through such hollow perforated metallic cylinders, or cylinder, so to be constructed as aforesaid, to suit cloth as aforesaid, in the ways and manner, and for the purposes aforesaid."

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38. For various improvements in, and modifications of, the *Instruments for applying the Galvanic Influence to the Cure of certain Diseases*, for which a patent was obtained, July 22, 1833; Daniel Harrington, city of Philadelphia, January 27.

(See notice of this, among the specifications.)

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39. For a *Machine for Smooth Planing and Planing Mouldings;* Charles Thompson, Poughkeepsie, Dutchess county, New York, January 29.

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40. For a *Machine for Sawing Tenons in Wood-work;* Charles Thompson, Poughkeepsie, Dutchess county, New York, January 29.

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41. For *Machinery for Mortising in Wood*; Charles Thompson, Poughkeepsie, Dutchess county, New York, January 29.

These three several patents are obtained for machinery first patented December 6, 1830, and afterwards on an amended specification December 6, 1832. It has been since deemed advisable to surrender this last patent, and to take new ones for the separate parts of the machinery. Our notice of the patent of December 1832, will be found in vol. xi. p. 376.

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42. For *Machinery for making Window Sash;* Joseph Ingham, Wyalusing, Bradford county, Pennsylvania, January 29.

The machinery here patented is to be applied to the same purpose to which that named in the three preceding was specially adapted; there, however, is little or no similarity between them in point of construction. That which is the subject of the patent before us is said to consist of seven parts, intended to be applied to as many distinct operations, but all concurring in the accomplishment of one object, the manufacture of window sash. This apparatus, in most of its parts,

however, is so similar to what has been frequently used by carpenters and cabinet makers, so as to render it doubtful whether it or either of its parts, can be made the subject of a valid patent. The first machine, for example, is a kind of trough in which the stuff to be planed is laid, and there operated upon by hand, in the usual way, the trough serving the purpose of gauging it to a width and thickness. Another is a box, made like a mitre box, with saw kerfs across it at proper distances for cutting lengths, and tenons. Another is a machine for preparing the pins, which consists of a steel bed, having a hole through it of the size of a pin, and sharp edges, so that in driving the splits through, the pin is formed. Such machines we have known for forty years, and have no doubt that they were then antiquities.

The claim made is to "the particular construction of the above described manufacture, together with the combined application of its several parts to the purpose of manufacturing window sash." Which claim we could not improve, as we know not how to make that new which is old.

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43. For a *Machine for Hulling Clover Seed;* Elias Horn, Arock's Gap, Rockingham county, Virginia, January 30.

This machine is made like the ordinary cylinder thrashing machine, consisting of a cylinder revolving in a concave bed. The cylinder and concave may both be made of wood, covered with sheet iron, and having pins driven into them in such a way that they will pass each other. The claim is to "the before described machine, with the arrangement of the several parts," which several parts consist of what we have already noticed, with an inclined plane, or hopper, for feeding.

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44. For a *Water Wheel;* Elisha Bushnell, Sodus, Wayne county, New York; an alien who has resided two years in the United States, January 30.

This wheel is to be placed at the bottom of a flume, through which rises a vertical shaft to drive the machinery. The wheel may be from four to six feet in diameter, and from four to six inches in thickness; the buckets are placed spirally round its circumference, appearing like the segment of a many threaded screw, the water entering at top, and escaping at bottom. The cylinder which forms the penstock is to surround the buckets so closely as just to allow them to revolve, or it may be attached to and revolve with them.

There is no claim made, and no room for one, as water wheels upon this principle have not the slightest claim to novelty; and, as regards their utility, they may be considered as upon a par with the tub wheel.

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45. For an improvement in the *Still*; Jacob Weitzel, city of Lancaster, Pennsylvania, January 30.

The improvement claimed consists in an additional tub, called the doubling tub, which is placed in part above the still, and has the doubler within it. The beer is to be pumped up into the first, or

highest tub, through a worm in which the doublings pass, when it becomes somewhat heated; it may thence be let into the doubling tub, where it may be made to boil, preparatory to its being conveyed into the still through a tube fixed for that purpose. The opening of this tube is stopped by a plug sufficiently long to reach to the top of the tub, so that it may be readily drawn and replaced. *A plug so fixed, is claimed by the patentee*, when used to let beer from one vessel to another.

The singlings pass from the still into the doubler through a long crooked neck; and from the doubler into the worm in the first beer tub, through a similar neck, and thence into the cooler worm. To prevent the loss of spirit, should the beer boil in the doubling tub, a tube ascends from the cover of it into the beer tub, where the vapour is condensed. Besides the foregoing parts, a vent cock is employed for the escape of air from the still; and some other unimportant appendages are mentioned, but the foregoing comprehends every thing which is essential in the description.

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46. For an improvement in the *Rolling Mill*; William V. Many, city of Albany, New York, January 30.

This is denominated an " improvement in the common plain grooved and fluted plating and adjusting rollers," which are intended for the rolling of any metallic substance in a bevelled, or wedge form, and is particularly adapted to the rolling of carriage springs, as well as for tools of various kinds, and many other articles. The patentee makes claims of a most comprehensive character, including many things of which, if he has really invented them, he is by no means the first inventor; we doubt, in fact, the originality of any thing which he has here claimed.

Rollers, made either in single pieces, or in separate parts, are to be mounted in a frame, in the way flatting or rolling mills are usually mounted; one of these rollers is to have depressions or grooves in it of such eccentricity and form as the nature of the article to be rolled may require. Sometimes he proposes to use the common cylindrical rollers, and to prepare a slab of metal of such form and varying thickness as shall cause the metal to be rolled to receive its proper form by being placed upon it, and passed between the rollers with it.

It is also contemplated to use a single cylindrical roller, with a movable bed under it, to be advanced by the turning of the roller, the bed being so inclined, or otherwise formed, as to produce the intended effect.

"The said William V. Many further claims as his invention, the application of all rotary, lateral, horizontal and perpendicular motions of machinery constructed, or that may be constructed, whereby the operation or effect of which said machinery is to roll or plate metallic tools, articles or machinery, trade or commerce, with one or more sides or edges in the form of an inclined plane, wedge or bevel, or in which the sides or edges are not equilateral; and in the same operations to stamp or impress on any and every such article, any and every device, design, or engraving, or milling, matting, or beading,

which may or shall be required for use or ornament, to or upon the article manufactured."

Without inquiring what has been done on the other side of the Atlantic, we could point to various patents issued here, for the application of rollers to numerous purposes, embraced within the scope of the foregoing claims. We will refer to our remarks upon two only, one for rolling steel for carriage springs, issued in July, 1830, p. 300, vol. 6, the other for rolling iron and other metal, p. 36 of this volume. It will be found that we have in both these instances treated the general principle as one which had been long since carried into operation. Even the modification which admits of the use of an inclined plane has been specifically claimed in a former patent; and as to the formation of beads and other ornaments by means of rollers, we have known it from boyhood, and that is some time ago. There are in use several machines for rolling axes and other tools, and eccentric rollers for plane irons specifically. We have had occasion more than once to advise persons who proposed to take patents for the same thing, that they had been forestalled.

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47. For a *Water Wheel*, called a "collective power water wheel;" Isaac Harrison, Middletown, Frederick county, Virginia, January 31.

In high falls, where it is desirable to use all the power of the water, two or more overshot wheels have sometimes been placed one above the other, to receive the water in succession. This is done in those cases only where a single wheel could not conveniently be made of sufficient diameter.

We have in the course of our animadversions, had occasion, formerly, to advert to this plan, and here we have it brought before us again under the form of a new patent, in which the patentee tells us that "the invention here claimed consists in the use of two or more water wheels placed above each other; the water of the one being thrown upon the one below, and the power collected for driving mills and machinery, as before described."

We have been acquainted with this application of water for at least forty years, and in our recollection upon such subjects, extended much farther back, we have no doubt that we might add a corresponding number to the forty. Such combined wheels, it is true, are not in common use, and that for the simple reason that the situations in which they are applicable are rare; we presume, however, that there are but few countries where they may not be found.

Specifications of American Patents.

Notice of the specification of a patent for an improvement in the machinery for spinning Rope Yarn, and Duck Twine. Granted to James Lang, of Greenock, in the kingdom of Great Britain, in pursuance of an Act of Congress, passed July 30*th*, 1832, *entitled "An act directing letters patent to be issued to Thomas Knowles, James Lang and William Steel, respectively." Issued January* 16, 1834.

On turning to Vol. xi. p. 4, there will be found a notice of the above named Act, accompanied by some remarks. It will be seen that eighteen months had elapsed after the passing of the act, before the issuing of the patent, and as, by the terms of the law, the machinery must be put into actual operation within two years of its date, the time for doing so has now nearly elapsed. We have not heard what has been done upon this subject, but as it was the design of the agent of the inventor to import the machinery in its perfect state, and to set it up in Kentucky, this has probably been done, although the fact has not come to our knowledge.

The specification of Mr. Lang's machinery is accompanied by three large drawings, which are referred to throughout. To those persons, however, who are conversant with what has been done in the spinning of flax and hemp by machinery, a sufficiently clear idea of the proposed improvements may be communicated without the drawings; and to others, the subject, if more fully treated, would not be one of much interest.

The specification commences by observing that there are certain machines known by the name of Gill spreading or drawing heads, and Roving or spinning frames, which have been used by flax spinners, for spreading or drawing, roving or spinning flax, to produce yarn suitable for sail cloth, and other coarse linen fabrics; but that these machines have not hitherto been applied for producing coarse yarn suitable for making cables, ropes, or cordage; and that his improvement consists in the application of some parts of these known machines, in combination with other parts not heretofore used in such machines; the combination and arrangement of these old and new parts being such as to effect the drawing and spinning of flax, hemp, or other fibrous materials, into yarn fit for cables, ropes, or cordage.

The machine as first described appears to differ but little, if at all, from that known under the name of "the first spreading or drawing frame," having a feeding apron, or horizontal band of leather upon which the material to be spun is spread, and by which it is carried forward to feeding rollers, on leaving which it is acted upon by gills, or needles, fixed on to an endless chain, between the feeding and drawing rollers, which draw and deliver it in the form of a sliver, into a can in front of the machine.

As the different kinds of hemp and flax vary considerably in the length of their fibre, it is observed by the patentee, that, if the feed-

ing rollers were fixed at an invariable distance from the ends of the gills, the ends of the fibres would not always be caught properly by them, but would sometimes fall short of, and at others overlap them; and that to obviate this, the frame carrying these rollers is made capable of sliding, so that its distance may be varied in any required degree. When the hemp or flax is of a very short fibre, he sometimes uses two pair of feeding rollers. These rollers are also made capable of being elevated or depressed, as well as moved horizontally, so that the depth to which the gills shall enter may be regulated by the height at which the feeding takes place. The gearing is so arranged as to cause the surfaces of the drawing rollers to move with from 40 to 60 times the speed of those of the feeding rollers, according to the quality of the material.

After the sliver has been prepared in the first machine, it is passed through a second, nearly identical in its construction, but made considerably lighter, and double, so as to pass two slivers through separate feeding and drawing rollers, having also two sets of gills, or points. The speed, as before, must, necessarily, be adapted to the kind of work to be performed; separate cans are used to receive the slivers as delivered.

A third drawing machine is next to be used, which does not in any respect differ from the second, excepting in the proportionate speed given to the parts respectively, so as still further to elongate, or draw out the slivers.

The fourth and last machine employed is, in part, constructed like the former, but with the addition of the spindles and their appurtenances, as it is in this machine that the slivers receive their last drawing, and are to be spun into yarn. These slivers pass from the drawing rollers through funnel shaped tubes, within which are pieces of felt, intended to hold and smooth the surface of the yarn, as it is held and smoothed in leather or felt in spinning through the hand. The spindles, bobbins, and fliers are like those in ordinary use, but made stronger, and turned with more power, corresponding with the coarseness of the thread which is to be spun by them.

As in spinning coarse yarns it is necessary that there should be a considerable drag upon the spindles, springs, capable of being tightened, are made to press upon the peripheries of cylindrical barrels attached to them below the spools.

The patentee states, in conclusion, that "he has described many parts, in the machinery used by him, which are not new, but that his improvement consist, 1st. In the arrangement of the feeding rollers, as described, whereby the same are movable, so that their position relatively to the gills or needles, can be adjusted. 2nd. In the apparatus described for receiving the slivers from the drawing rollers of the roving frame, and which contain layers of felt or cloth through which the yarns are drawn by the fliers of the bobbin spindle. 3dly. In the method of applying friction readily, in order to produce such a resistance of the bobbins to be turned round as will cause the yarn to be taken up and wound properly in the bobbins. The said improvements are claimed when the same are applied in conjunction

with the other known parts; being so proportioned and arranged as to act properly with my improvements, and to form when combined with them, a series of machines for the purposes of producing from flax, hemp or similar fibrous substances, dressed or undressed, wove yarn, suitable for making ropes or cordage."

Remarks by the Editor.—We confess that we have been much disappointed in the anticipations which we had entertained when we were about to examine this specification. We could not have conceived it possible that the space which it occupies, and the drawings which accompany it could have been devoted to improvements so simple in their character, and so easily described. As respects the three things claimed, two of them, at least, may be dispensed with. Thus, for example, instead of making the rollers adjustable, as described, separate machines, differently proportioned, would produce the same result, although, certainly, at a greater expense. It may admit of a doubt, however, whether there is sufficient novelty in this part to sustain the claim, the making of rollers adjustable in similar machinery being a very common practice. The third claim, for increasing the drag on the bobbin, must be confined, as it is, to the particular mode of accomplishing it, as the same end has been heretofore attained by other means; such, for example, as embracing the spindle by a leather collar, the friction of which is regulated by weights, and other modes that will readily suggest themselves. The second claim, to the felt, or cloth, in the conical funnel, alone remains, and this probably, is new, and may be the best mode of attaining the end, and this, in our opinion, is all that can be safely looked to for sustaining the patent, but it is claimed in conjunction with the others.

Should it appear, however, that, from any cause, the machinery now patented produces a better effect, in making *coarser yarn* than has heretofore been produced, we shall readily admit this as a sufficient proof of novelty, and shall heartily wish all success to the proprietors.

Description of an improvement for preventing the waste of heat in Cook Stoves; applicable to other furnaces; for which a patent was granted to ELIPHALET NOTT, *of Schenectady, New York, January 9th,* 1834.

The design of this invention is to prevent the loss of heat in those cook-stoves, which have ovens under and around which flame passes, causing it to produce useful effects by preventing its passing into the room. After specifying particularly the arrangements by which the contemplated end is to be attained, the patentee furnishes the following "SUMMARY"

"The invention and improvement herein contemplated consists in preventing the waste of heat in cook stoves:

"By adjusting the chamber of combustion centrally, and surrounding the same, as far as may be, by the chamber, or chambers, of treatment, in such manner that the heat, in escaping to the room

from the former, must pass through the latter, and be, in passing, either reflected by an interior crust that is a reflector, or arrested by one that is a non-conductor—either in single or double laminae; and if double, with an empty space, or a stratum of non-conducting material between the two—which may be effected by a combination of concentric hollow cylinder or prisms, of the kind, and in the manner aforesaid, or by any other combination preferred—also—

"By combining separate ovens, having an exterior crust of hammered sheet iron, common sheet tin, polished iron, or other metallic reflector, with a central chamber of combustion and flue for flame, either reverberated or not, in such a manner that the former shall be heated by radiation and reflection from the latter, and each, from an integral part of the same instrument:

"Or by combining in a similar manner, a single similar oven, to be heated as aforesaid, with an adjoining chamber of combustion, and flue for flame, whether reverberated or not; from the opposite side of which chamber of combustion and flue, the escape of heat is prevented by a lining of brick, or other non-conducting material—and—

"In preventing the unnecessary diffusion of heat and steam,—

"By suspending over the entire stove, especially in summer, a sheet tin, or other metallic canopy, with an outlet at the apex connecting with the chimney.

The foregoing modes or principles of arrangement are recapitulated, and become the foundation of what is claimed as new.

The intention of the patentee, cannot, we are aware, be fully understood by the foregoing description, or without the drawings, which are deposited in the patent office; these are very well executed, exhibiting the stove in various forms and modes of arrangement, which, however, are not of a character admitting of their being intelligibly described without the drawings themselves. The fireplaces, or *chambers of combustion*, is, as will be seen by examining the foregoing summary, situated in the centre of the stove, and is surrounded by the ovens, or *chambers of treatment*, so that no heat can radiate from the walls of the former without passing through the latter, in the outer wall, or crust of which it is connected by a non-conducting lining. The heat which tends to escape from the lower part of the chamber of combustion, is, in some cases, to be reflected up by polished metal, against the bottom of the oven, by a hollow case, or crust, so placed as to produce that effect. On the top plate there are openings for boilers, made in the usual way, dampers and valves being so placed as to admit and direct the ascending current of heated air, &c. as may be required.

ON THE MANUFACTURE OF VARNISHES.

(Continued from p. 60.)

Directions for making Varnish on the small scale, with the fewest utensils.

First procure a gum pot, No. 3, or smaller if required; then a three-footed iron trevet with a circular top, the feet sixteen inches in

length, and made to stand wider at the bottom than top, which is to be made so as the pot will fit easily into it. Place the trevet in a hollow in a field, yard, garden, or out house, where there can be no danger from fire; raise a temporary fireplace round the trevet with loose bricks, after the same manner that plumbers make their furnaces; then make up a good fire with either coke, coal, or wood charcoal, which is far preferable; let the fire burn to a good strong heat; set on the gum pot with three pounds gum copal: observe, that if the fire surround the gum pot any higher inside than the gum, it is in great danger of taking fire. As soon as the gum pot begins to fuse and steam, put in the copper stirrer, and keep cutting, dividing, and stirring the gum to assist its fusion; and if it feels lumpy and not fluid, and rises to the middle of the pot, lift it from the fire, and set it on the ash bed, and keep stirring until it goes down (meantime let the fire be kept briskly up;) then set on the gum pot again, and keep stirring until the gum appears fluid like oil, which is to be known by lifting up the stirrer so far as to see the blade. Observe, that if the gum does not appear quite fluid as oil, carry it out whenever it rises to the middle of the pot, and stir it down again, (keep up a brisk fire,) put on the pot, and keep stirring until the gum rises above the blade of the stirrer, call out to the assistant "be ready:" he is then, with both hands, to lay hold of the copper pouring jack, charged with clarified oil from No. 2, and lean the spout about one inch and a half over the edge of the gum pot; let him keep himself firm, steady, and collected, and not flinch, spill, or pour the oil, which would perhaps set all on fire. Observe when the gum rises within five inches of the pot mouth, call out "pour;" the assistant is then to pour in the oil very slowly until towards the last, the maker stirring during the pouring.

If the fire at this time is strong and regular, in about eight or ten minutes the gum and oil will concentrate and become quite clear: this is to be tested by taking a piece of broken window glass in the left hand, and with the right lifting up the stirrer and dropping a portion of varnish on it; if it appears clear and transparent, the oil and gum are become concentrated or joined together. It is now to be further boiled until it will string between the finger and thumb: this is known by once every minute dropping a portion on the glass, and taking a little between the fore finger and thumb; pinch it first, then extend wide the finger and thumb: if it is boiled enough, it will stick strong and string out into fine filaments like bird lime; but when not boiled enough, it is soft, thick, and greasy, without being stringy. The moment it is boiled enough, carry it from the fire to the ash-bed, where let it remain from fifteen to twenty minutes, or until it is cold enough to be mixed; have at hand a sufficient quantity of oil of turpentine to fill the pouring pot, begin and pour out with a small stream, gradually increasing it, and if the varnish rises rapidly in the pot, keep stirring it constantly at the surface with the stirrer to break the bubbles, taking care not to let the stirrer touch the botton of the pot, for if it should, the oil of turpentine would be in part converted into vapour, and the varnish would run over the pot in a moment; therefore, during the mixing, keep constantly stirring as well as pouring in at the same time. Have also a copper ladle at hand, and if it

should so far rise as to be unmanageable, let the assistant take the ladle and cool it down with it, lifting up one ladleful after another, and letting it fall into the pot. As soon as the varnish is mixed, put the varnish sieve No. 1 in the copper funnel placed in the carrying tin, and strain the varnish immediately; empty it into open mouthed jars, tins, or cisterns; there let it remain to settle, and the longer it remains the better it will become. Recollect, when it is taken out, not to disturb or raise up the bottoms.

General Observations and Precautions to be observed in making Varnish.

Previous to beginning to make varnish, take care that the making house is completely cleared of every unnecessary article. Have every necessary article perfectly clean and in good order. If the weather is fine, at a convenient distance outside sift some dry ashes through a fine sieve to form an ash bed; make it a little larger than the bottom of the boiling pot, one inch and a half deep, and smooth and level on the surface, on which set the boiling pot every time it is necessary to bring it out.

About four feet from the ash bed erect a circle of loose bricks four courses high; lay them so that when the gum pot is set within it will rest securely by its flanch, with the bottom about six inches from the ground. Upon this brick stand set the pot each time there is occasion to carry it out, and stir it down; four feet from the stand set the iron trevet for turning up the gum pot each time after it is washed out, as by so doing it will always be kept clean, and cool gradually; for, by cooling very rapidly, copper oxidises very quickly. Near the trevet set the large wide tin jack, ready to receive the washings; also the swish broom each time the pot is washed out. Have also at hand one copper ladle, and a tin bottle with three gallons of oil of turpentine for washing with when wanted. Supposing every thing so far ready, if both the boiling pot and gum pot are to be used at the same time, let the assistant lay the fire ready, set on the boiling pot with eight gallons of oil, kindle the fire; then lay the fire in the gum furnace, have as many eight pound bags of gum, all ready weighed up, as will be wanted; put one eight pound into the pot; put fire to the furnace, set on the gum pot, in three minutes (if the fire is brisk) the gum will begin to fuse and give out its gas, steam, and acid; stir and divide the gum, and attend to the rising of it, as before directed: eight lbs. of copal takes, in general, from sixteen to twenty minutes in fusing, from the beginning, till it gets clear like oil; but the time depends very much on the heat of the fire and the attention of the operator. During the first twelve minutes, while the gum is fusing, the assistant must look to the oil, and bring it to a smart simmer, for it ought to be neither too hot, nor yet too cold, but in appearance beginning to boil, which he is strictly to observe, and, when ready, call out 'bear a hand,' then immediately each lay hold of one handle of the boiling pot, lift it right up so as to clear the plate, carry it out and place it on the ash bed, the maker instantly returning to the gum pot, while the assistant puts three copper ladlefuls of oil into the copper pouring

jack, bringing it in and placing it on the iron plate at the back of the gum pot to keep hot until wanted. When the maker finds the gum is nearly all completely fused, and that it will in a few minutes be ready for the oil, let him call out, "ready oil;" the assistant is then to lift up the oil-jack with both hands, one under the bottom, and the other on the handle, laying the spout over the edge of the pot, and wait until the maker calls out "oil;" the assistant is then to pour in the oil as before directed, and the boiling be continued until the oil and gum become concentrated, and the mixture looks clear on the glass; the gum pot is then to be set upon the brick stand until the assistant puts three more ladlefuls of hot oil into the pouring jack, and three more into a square tin for the third run of gum. There will remain in the boiling pot still three and a half gallons of oil. Let the maker put his right hand down the handle of the gum pot near to the side, with his left hand near the end of the handle, and with a firm grip lift the gum pot, and deliberately lay the edge of the gum pot over the edge of the boiling pot, and gently raise up the bottom of the gum pot until all its contents run into the boiling pot. Let the gum pot be held, with its bottom turned upwards, for a minute, right over the boiling pot. Observe, that whenever the maker is beginning to pour, the assistant stands ready with a thick piece of old carpet, without holes, and sufficiently large to cover the mouth of the boiling pot should it catch fire during the pouring, which will sometimes happen if the gum pot is very hot; should the gum pot fire, it has only to be kept bottom upwards, and it will go out of itself; but if the boiling pot should catch fire during the pouring, let the assistant throw the piece of carpet quickly over the blazing pot, holding it down all round the edges; in a few minutes it will be smothered. The moment the maker has emptied the gum pot, throw into it half a gallon of turpentine, and with the *swish* immediately wash it from top to bottom, and instantly empty it into the flat tin jack; wipe the pot dry, and put in eight lbs. more gum, and set it upon the furnace; proceed with this run exactly as with the last, and afterwards with the last or third run. There will then be eight gallons of oil, and twenty-four pounds of gum in the boiling pot, under which keep up a brisk, strong fire until a scum or froth rises and covers all the surface of the contents, when it will begin to rise rapidly. Observe, when it rises near the rivets of the handles, carry it from the fire, and set it on the ash bed, stir it down again, and scatter in the driers by a little at a time; keep stirring, and if the frothy head goes down, put it upon the furnace, and introduce *gradually* the remainder of the driers—always carrying out the pot when the froth rises near the rivets. In general, if the fire be good, all the time a pot requires to boil, from the time of the last gum being poured in, is about three and a half, or four, hours; but *time* is no criterion for a beginner to judge by, as it may vary according to the weather, the quality of the oil, the quality of the gum, the driers, or the heat of the fire, &c.; therefore, about the third hour of boiling, try it on a bit of glass, and keep boiling it until it feels strong and stringy between the fingers—it is then boiled sufficiently; carry it on the ash-bed, and stir it down until it is cold enough to mix, which will de-

pend much on the weather, varying from half an hour in dry frosty weather to one hour in warm summer weather. Previous to beginning to mix, have a sufficient quantity of turpentine ready, fill the pot and pour in, stirring all the time at the top, or surface, as before directed, until there are fifteen gallons, or five tins, of oil of turpentine introduced, which will leave it quite thick enough, if the gum is good and has been well run; but if the gum was of a weak quality, and has not been well fused, there ought to be no more than twelve gallons of turpentine mixed, and even that may be too much. Therefore, when twelve gallons of turpentine have been introduced, have a flat saucer at hand, and pour into it a portion of the varnish, and in two or three minutes it will show whether it is too thick; if not sufficiently thin, add a little more turpentine, and strain it off quickly. As soon as the whole is stored away, pour the turpentine washings with which the gum pots have been washed into the boiling pot, and with the swish quickly wash down all the varnish from the pot sides; afterwards, with a large piece of woollen rag dipped in pumice powder, wash and polish every part of the inside of the boiling pot, performing the same operation on the ladle and stirrers; rince them with the turpentine washings, and at last rince them altogether in clean turpentine, which also put to the washings: wipe dry, with a clean soft rag, the pot, ladle, stirrer, and funnels, and lay the sieve so as to be completely covered with turpentine, which will always keep it from gumming up. The foregoing directions concerning running the gum and pouring in the oil, and also boiling off and mixing, are, with very little difference, to be observed in the making of all sorts of copal varnishes, except the differences of the quantities of oil, gum, &c. which will be found under the various descriptions by name, which will be hereafter described.

On Gums Copal.

Gums copal are of three different sorts and qualities: the best is brought from Sierra Leone, in Africa, and, when imported, is about the size of small potatoes, and is covered all over with a rough coat of dust, or clay-like substance. It is most commonly bought in that state by varnish makers, gum dealers, and druggists, who scrape it; that is, they generally have women who scrape it, bit by bit, with sharp penknives or razors: it is rather pared than cut quite free from dust; it is afterwards picked by hand into three different qualities. All the finest and palest is put by itself; this call body gum: pick out the next best, and placing it by itself, call it carriage gum. From the remainder pick out all pieces of wood, stones, &c.; this is the third or worst quality, and serves for gold size or japan black.

The second sort of gum copal, imported from South America, is, in appearance, somewhat like the African, but much larger, and to those who are not good judges, appears far the best, although in reality not worth one-third the value of African, as, after all the labour of scraping, picking, &c., it is, in general, so full of acid and sap, that not above two-thirds of it is fusible, and perhaps, in many instances, not

more than one-third, and some whole casks are imported not worth one farthing; however, by proper judgment and long experience, there may at times be found some passable samples, which may answer for very cheap varnishes.

The third sort of gum copal is never imported by itself, but is found mixed among the gum anime. It is very large, pale, hard, and transparent, and fuses well and fixes well, and makes excellent varnish.

Gum Anime.

All gum anime is imported from the East Indies, and is sold at the Company's sales in lots of two chests, each weighing from three to five cwt., the sizes varying very much, as well as the quality. The chests which contain the palest and largest gum always sell for the highest price, particularly those chests which are imported ready scraped, as there are great quantities imported which come over unscraped, and is termed pickled; that is, clean from its rust by laying for several days in a very strong alkali, well washed with a broom, and afterwards washed with water. This sort is not so good as that which is scraped with the knife, and it in general sells for one-third less than that which is scraped. But in picking and sorting anime, observe and pick out all the fine, large, and transparent pieces first; these call body gum: then pick and sort the remainder as directed for the copal, making three sorts. Recollect, all sorts of gums can be procured, ready picked and sorted, from the gum merchants and dealers.

Amber.

There are two sorts of amber, each of various qualities: the best is imported from Prussia and Poland. It is found in mines and in rivers. It is very thin, solid, pale, hard, and transparent. It is the sort from which beads are made, and many other curiosities, and forms the most solid, hard, and durable varnish that can be made, either by employing it by itself, or as a component part with gum, &c. The other sort of amber is called sea amber: it comes from many places abroad. It is much darker than the first amber, and about the size of coffee beans; is harder to fuse, has less fluidity, affords most salt, gas, and acid during its fusion, and leaves a considerable quantity of impure earthy matter at the bottom of the pot on fusion, whereas the best sort will completely dissolve like oil.

Gum Sandarach

Is so well known that no description is necessary. Procure the largest and cleanest, which will always be found the cheapest in the end.

Gum Mastic

Is likewise well known, can be procured at almost every druggist's shop, and when very fine mastic varnish is required for valuable paintings, the mastic is put upon a tea-tray, or mahogany table, and every fine and clean piece picked out, until all the inferior, small, yellow,

and dirty, are left. Take a sufficient quantity of the fine picked mastic, and reserve it for making picture varnish; the inferior reserve for common mastic varnish.

Gum Cat's-eye

Is a large, pale, transparent gum, but little known; it is quite resinous and pulverulent between the teeth; is like gum sandarach. It is very pale, will dissolve in hot turpentine, is very little better than pale rosin, and is chiefly used in making a varnish for paper hangings, and adulterates common cheap mastic varnish.

These are the principal gums required in the making of varnish; any others required being in such very small quantities that their description is unnecessary.

After having procured the necessary gums, and sorted them as before directed, procure a board about the size of a large tea tray, and fix on to it a back and two ends, leaving it open at front; procure also a piece of lead, eight inches long by six inches broad, and two inches thick; place the lead on the wooden tray, fill one end of the tray with the assorted gum, which requires breaking; procure, likewise, a small hammer with the end reversing, the proper face of the hammer steeled and ground quite sharp; sit down, and with the left hand drag to one side every piece of gum that does not require to be broke, but every piece above the size of a filbert lay on the piece of lead, and holding the gum flat and steady between the fore finger and thumb of the left hand, with the hammer in the right hand, hit the piece of gum one steady stroke, and cut it by piece after piece, into the size of common filberts; the gum is then ready for the gum pot. Recollect, during the process of breaking gum, to cut out every black, dirty, or watery piece as it comes to hand, and lay them aside, to be used with similar sorts.

[TO BE CONTINUED.]

Selection of earthy Matter by the roots of Plants.

In the Philosophical Magazine for January is an abstract of a paper by Dr. Daubeny, Professor of Chemistry in the University of Oxford, which was read before the Linnæan Society on the 19th of November and 3d of December last, entitled, "On the Degree of Selection exercised by Plants with regard to the Earthy Constituents presented to their Absorbing Surfaces." This paper, which is altogether experimental, bears directly on the theory of the absorption of nutriment in general by plants.

The author states that he was first led into this train of experiment with the hope of ascertaining, by more decisive experiments than had been hitherto done, whether plants are able, under any circumstances, to form those earthy and alkaline matters which they usually contain, when not supplied with them from without.

With this view, he planted a known weight of the seeds of certain vegetables in earths of known composition, introduced, in a finely divided state, into boxes cased internally with sheet zinc. One box,

containing each kind of earth, was placed in a garden exposed to rain and dust, and a corresponding one of each kind in a green-house protected from both. The earths employed were, washed sea sand, Carrara marble, and sulphate of strontian.

The crop obtained from each of the boxes was separately burnt, and the ashes weighed and examined chemically. That from the boxes placed in the garden was greater than that from those in the green-house; but in both cases an increase of earthy matter was observed beyond that which existed in the seeds from which they had sprung.

Having remarked, however, that the plants grown in strontian contained none of that earth, he resolved to try whether this circumstance might be owing merely to the insolubility of the sulphate in water, or to some specific power, belonging to the plant, of rejecting the earth in question.

He therefore varied the experiment the succeeding year, by planting the seeds in four different soils, namely, sand, marble, sulphate of strontian, and flowers of sulphur, and watering them with a weak solution of nitrate strontian. In every instance there was an increase of calcareous matter, beyond that present in the seeds; greatest in the plants that had grown in sulphate of strontian and in Carrara marble, least in those planted in sulphur; but the largest quantity of strontian ever detected by chemical means from their ashes did not exceed 0.4 of a grain. From these and similar experiments detailed in the memoir, the author concludes that the absorbing surfaces or spongioles of the roots of plants either do not admit of strontian earth at all, even in a state of solution, or at least receive it much less readily than they do calcareous matter.

He details an experiment to show that the absence of strontian from the solid parts of the plants was owing to its remaining unabsorbed by the roots, not to its being excreted by them, and accounts for the difference between what happened in the instance of the strontian, and that which he had himself observed in common with M. de Saussure, as holding good with regard to solutions of substances more directly injurious to the plant, by supposing, in the latter instance, the spongioles to be disorganized by the poisonous quality of the substance, and consequently to have allowed the solution to be absorbed by capillary attraction. In this latter case he observed, that before the plant is destroyed, a portion of the poisonous substance will be excreted again by the spongioles of the roots.

Upon the whole he concludes, that his experiments lend no countenance to the idea that plants can form earthy constituents when not supplied to them from without, although they do not altogether demonstrate the reverse. They seem, however, to show more decisively that plants do, to a certain extent at least, possess a power of selection, and that the earthy constituents which form the basis of their solid parts are determined as to *quality* [*kind?*] by some primary law of nature, although their *amount* may depend upon the more or less abundant supply of the principles presented to them from without. [*Rep. Pat. Inv.*

Incorporated Rail-road Companies in the State of New York.

NAMES.	To construct a Rail-road, From	To	When incorporated.	Capital.
Albion and Tonawanda	Albion	Batavia	1832	$250,000
Auburn and Canal	Auburn	Erie Canal	1832	150,000
Aurora and Buffalo	Aurora	Buffalo	1832	300,000
Brooklyn and Jamaica	Brooklyn	Jamaica	1832	300,000
Buffalo and Erie	Buffalo	Erie, Penn.	1832	650,000
Black River Company	Rome	Ogdensburg	1832	900,000
Buffalo and Black Rock	Buffalo	Black Rock	1833	100,000
Binghamton and Susquehanna	Binghamton	Penn. Line	1833	150,000
Catskill and Canajoharie	Catskill	Canajoharie	1830	600,000
Dansville and Rochester	Dansville	Rochester	1832	300,000
Dutchess	Poughkeepsie	Connecticut	1832	600,000
Elmira and Williamsport	Elmira	Pennsylvania	1832	75,000
Fish House and Amsterdam	Fish House	Amsterdam	1832	250,000
Great Au Sable	Keesville	Port Kent	1833	60,000
Harlaem	Prince-st. N. Y.	Harlaem	1831	350,000
Hudson and Berkshire	Hudson	Mass. St. Line	1832	350,000
Hudson and Delaware	Newburgh	Delaware River	1830	500,000
Ithaca and Geneva	Ithaca	Geneva	1832	800,000
Ithaca and Owego	Ithaca	Owego	1828	300,000
Lake Champlain and Ogdensburgh	Lake Champlain	Ogdensburgh	1832	3,000,000
Mayville and Portland	Portland	Mayville	1832	150,000
Mohawk and Hudson	Schenectady	Albany	1826	600,000
New York and Albany	New York	Albany	1832	3,000,000
New York and Erie	New York	Lake Erie	1832	10,000,000
Otsego	Cooperstown	Colliersville	1832	200,000
Rensselaer and Saratoga	Troy	Ballston Spa.	1832	300,000
Rochester	Rochester	Genesee Port.	18 1	30,000
Saratoga and Fort Edward	SaratogaSprings	Fort Edward	1832	200,000
Saratoga and Schenectady	Saratoga	Schenectady	1831	150,000
Saratoga Springs and Schuylerville	SaratogaSprings	Schuylerville	1832	100,000
Schoharie and Otsego	Schoharie Co.	Susque. river	1832	300,000
Tonawanda	Rochester	Attica	1832	500,000
Utica and Susquehanna	Utica	Susque. River	1832	1,000,000
Utica and Schenectady	Utica	Schenectady	1833	2,000,000
Warren County	Glenn's Falls	Warrensburg	1832	250,000
Watertown and Rome	Rome	Watertown	1832	1,000,000
Whitehall and Rutland	Whitehall	Rutland, Vt.	1833	150,000
				$29,865,000

Damascus Steel.

The steel of which the beautiful sword blades of Damascus are manufactured, has hitherto baffled all attempts at imitation. It is ge-

nerally supposed to be made of slips or thin rods or wires of iron and steel, bound together by iron wire, and then melted together by heat. The most skilful workmen of other countries have attempted to imitate this process, but in vain; so that there is reason to think that the secret of the manufacture has not yet transpired. The colour of the Damascus blades is a dull bluish gray, and scarcely exceeds in hardness common steel from the forge. It is difficult to bend; and when bent does not resume its shape; the principal character, however, is its *water*, or a peculiar wavy appearance running from the hilt to the point in narrow lines, the thickness of a harpsicord wire, which never cross each other. These waving lines arise from a slight difference in the degree of polish occasioned by the unequal action of acid upon the steel; any weak acid would produce this effect, but at Damascus sulphate of alumine is the substance used. This appearance of waving lines has been imitated by a false damasking, or etching, but the genuine Damascus blade is distinguished from the false one by the obliteration of the lines in grinding, which takes place in the latter. In the real Damascus blades, grinding nearly removes the water, but it immediately reappears by rubbing the blades with lemon juice.

CELESTIAL PHENOMENA, FOR SEPTEMBER, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.				
6	8	54	Im. 79 Virginis	,7,	N127°	V178°
6	9	24	Em.		191°	240°
8	8	42	Im. β' Scorpii	,2,	191°	237°
8	9	46	Em.		193°	228°
11	10	22	N. App. ☽ and 261 Sagittarii	,6, 7,	☽ South	3'.3
14	7	58	Im. κ Capricorni	,5,	156°	164°
14	9	3	Em.		250°	264°
17	7	7	N. App. ☽ and 249 Piscium	,7,	☽ South	4'.1
17	7	16	Im. r Piscium	,5, 6,	135°	184°
17	8	23	Em.		281°	340°
17	10	3	Im. s Piscium	,5,	102°	72°
17	11	24	Em.		326°	302°
19	17	39	Im. ν Piscium	,5,	66°	114°
19	18	24	Em.		350°	40°
20	6	57	N. App. ☽ and 64 Ceti	,6, 7,	South	0'.5
23	17	37	Im. ♃'s centre		152°	189°
23	18	38	Em.		234°	285°
20	7	29	Im. ξ' Ceti	,5,	120°	69°
20	8	38	Em.		288°	237°
24	12	35	Im. 121 Tauri	,6,	42°	345°
24	13	7	Em.		345°	284°

Sympathetic Ink.

The following affords a sympathetic ink very far superior to any, as yet, in use. Dissolve a small quantity of starch in a saucer with soft water, and use the liquid like common ink: when dry, no trace of the writing will appear upon the paper, and the letters can be developed only by a weak solution of iodine in alcohol, when they will appear of a purple colour, which will not be effaced until after long exposure to the atmosphere. So permanent are the traces left by the starch, that they cannot, when dry, be affected by Indian rubber, and in another case a letter which had been carried in the pocket for a fortnight, had the secret characters displayed at once, by being very slightly moistened with the above-mentioned preparation.

Meteorological Observations.

Meteorological Observations for June, 1834.*

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	56°	64°	29.80	29.70	SE.	Moderate.	0.53	Rain—drizzle.
	2	64	75	.50	.50	SW. W.	Stormy.		Cloudy—clear.
	3	47	68	.65	.65	W.	do.		Clear day.
	4	47	77	.70	.65	SW.	Moderate.	1.10	Clear; cl'dy; rain in ni't.; thunder
	5	52	53	.35	.35	W.	do.	0.20	Rain—drizzle. [and lightning.
	6	57	76	.65	.75	N. S.	do.		Clear day.
⊗	7	56	83	.75	.75	NW.	do.		Clear day.
	8	67	86	.75	.80	W.	Calm.		Clear—aurora borealis.
	9	65	91	.80	.80	S. SSW.	Breeze.		Clear do.
	10	64	92	.80	.80	SW.	do.	0.50	Clear—storm in the evening.
	11	70	71	.64	.80	SW. W.	do.		Cloudy; clear; bright in the north.
	12	52	74	.85	.90	W.	do.		Clear—aurora borealis.
	13	56	80	.85	.75	SW.	do.		Cloudy—lightly cloudy.
☾	14	53	74	.80	.85	W.	do.		Clear—flying clouds.
	15	54	79	.70	.90	SSE.	do.	0.15	Clear—fly. clouds—rain in night.
	16	59	70	.80	.80	SE W.	do.		Cloudy day.
	17	58	64	.80	.80	SE.	do.	0.34	Cloudy—rain in the night.
	18	62	74	.54	.35	SE SW.	Stormy.		Cloudy—flying clouds.
	19	65	78	.55	.55	W.	do.		Clear day.
	20	58	78	.65	.65	W.	Breeze.		Clear day.
☺	21	54	81	.70	.70	W.	do.	0.10	Clear—fly. clouds—rain in night.
	22	62	80	.70	.75	SE.	do.	0.18	Cloudy—clear—rain in night.
	23	68	85	.70	.75	SW.	do	0.06	Cloudy—clear—rain in night.
	24	69	89	.75	.70	SW.	do.	0.09	Cloudy—clear—shower.
	25	63	78	.70	30.05	SW.	do.		Clear day.
	26	69	85	.95	29.90	SW.	do.		Fog—flying clouds.
	27	62	83	30.00	30.00	W.	do.		Clear day.
☽	28	59	60	.00	29.95	SE.	do.	0.18	Shower—cloudy.
	29	62	74	29 74	.74	NE. W.	do.	0.10	Drizzle—Fly. cl'ds—rain in night.
	30	63	77	.74	.85	W.	do.		Clear day.
	Mean	59.77	76.73	29.73	29.75			3.53	

	Thermometer.	Barometer.
Maximum height during the month,	94. on 9th.	30.05 on 25th.
Minimum do.	47. on 3d & 4th.	29.35 on 5th, & 18th.
Mean do.	68.25	29.71

* Errata.—The Meteorological Table in the July number was for the month of May, and not for April, as marked.

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

SEPTEMBER, 1834.

Experiments to determine the proper relative dimensions for the cylinder of a Steam Engine.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Having several years since made a few experiments to ascertain the best proportion for the cylinder of a steam engine, I respectfully submit the following sketch of the results. The boiler made use of was placed vertically, the fireplace being on the inside. The cylinders used were made of brass, fitted with care, and every precaution was taken to equalize the friction, the quantity of work done, and the quantity of fuel used. None of the trials were discontinued until decisive results appeared to have been obtained.

Experiment No. 1.—The cylinder used in this experiment was four and a half inches in diameter, and had a stroke of nine inches. It was governed to various velocities, until the most efficient and economical was found, which was adopted. *The same rule was followed in all eases in relation to determining the best rate of motion of the piston.* This engine worked well, doing the work of five men, and consuming one ton of coal in twelve days, but close attention to the fire was necessary to keep a sufficient supply of steam without losing time.

Experiment No. 2.—A cut off valve, so arranged as to shut off the steam at any point, and regulated by the governor was now added, and at once removed the difficulty of keeping up the steam, and ex-

tended the time required to burn a ton of coal to fourteen days. The cut off was occasionally thrown off for the purpose of verifying this and the preceding experiment.

Experiment No. 3.—Cylinder No. 2. With this cylinder the length of stroke was nine inches, the diameter of the cylinder being seven inches. This worked with great power and smoothness, but steam could not be kept up by the consumption of one ton of coal in twelve days; the quantity of work performed was reduced full twenty per cent. below experiment No. 2. All attempts to apply the cut off proved abortive, and after doubling the weight of the fly wheel without improvement, the whole machine was placed in the hands of an experienced builder, with permission to make whatever alterations he thought proper, on condition of taking the engine at cost price, should it not prove good.

In the above trials the time required to get up the steam to one hundred pounds, was about twenty-five minutes. While the engine was being rebuilt, the boiler was reset, and such alterations made as enabled us to bring the steam to one hundred pounds in twenty minutes.

Experiment No. 4.—Cylinder No. 2; rebuilt, with a fly wheel six feet in diameter, and weighing four hundred pounds. A variable cut off was applied, and regulated by the governor, but after some days spent in ineffectual attempts to make use of it, it was abandoned, and no further trials made with it on this cylinder. Owing to the increased draught, the consumption of fuel was one ton in ten days, but no advantage was gained over experiment No. 3.

Experiment No. 5.—Finding so little encouragement to continue the above form, it was determined to try the other extreme; and experiment No. 5, was performed with a cylinder two and seven-eighths inches in diameter, and of fifteen inches stroke, and using a permanent cut off at half stroke. This immediately proved its superiority, by reducing the consumption to one ton in eighteen days, the boiler having been restored to its original setting.

Experiment No. 6.—The long slide and cut off valves were now removed, and a combination of two steam valves cutting off at half stroke close to the end of the cylinder, and two escape valves, worked by the same eccentric, and all enclosed in the same steam box, was substituted. The escape valves were so arranged as to permit the steam to escape *previous* to the crank reaching the centre. This effected a further reduction in the cost of fuel, having extended the time to twenty days; but several additional machines having been added to those already in use, the time was finally reduced to sixteen days.

Valves of the form last used are well adapted for locomotive engines, being easily kept in repair, and requiring no other apparatus for moving them, than the simple eccentric and rod, and possessing the peculiar quality of letting on the steam during the whole length of the stroke when worked by hand, but cutting off at half stroke whenever the eccentric rod is thrown into gear.

J. M.

Philadelphia, July 6th, 1834.

P. S. The engine with which experiment No. 4 was tried, has lately had two inches added to the thickness of the piston, and the length of stroke reduced to seven inches. This I am told has proved injurious, but as my informant is not at present in this city, I cannot say to what extent.

M.

Some Experimental Researches to determine the nature of Capillary Attraction. By John W. Draper.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

If we take a couple of leaden bullets, and pare away from each of them a small shaving, with a sharp penknife, so as to leave a bright, plane, metallic surface, on bringing them into contact, and gently pressing them together, they will be found to adhere very strongly—it requires some effort to separate them. The same takes place where two pieces of plate glass are used, and this phenomenon sometimes occurs on a large scale in manufactories of plate glass, where the pieces, after being dressed are piled on one another. The attractive force, acting constantly for a length of time, during which extensive barometric and thermometric changes occur in the atmosphere, the effect is to bring the pieces into such close contact, that they actually become united, and may be cut as one piece by a diamond.

We may likewise observe round the edge of a glass of water, that the liquid appears to stand higher wherever it touches the glass, than it does in the centre of its surface. From the former experiment, we see that solid bodies, upon an approximation almost to contact, attract each other; from the latter, that the attraction still exists even if one of the bodies be a liquid; for this rise of water, is plainly owing to the existence of an attractive force, between the water and the glass.

If we take a tube of small diameter, and dip one end of it into a cistern of water, we see the effect of this attraction in its most striking point of view. The liquid immediately rises in the tube, to a height proportionally greater as the tube is smaller. Glass tubes may be made of such excessive fineness, that their bore shall be much less than the diameter of a hair. Such tubes are called capillary tubes, and from the phenomenon taking place in them to the greatest extent, this attraction has been called capillary, or the phenomena of capillary tubes.

But, while some liquids thus rise in glass tubes, there are others in which a reverse effect takes place; mercury, or melted lead, or tin, falls. The circumstance of a rise or fall, appears to be dependant on the nature of the tube and liquid as regards each other; thus if a tube be indued with grease, water will not rise in it, but is depressed. For different tubes of different diameters, the elevation or depression of a liquid, is in the inverse ratio of their diameters.

It is not known to whom we are indebted for the discovery of these singular facts, as they were well ascertained before the time of Newton—they are doubtless the result of the labours of some early experimenter. Boyle made experiments on the adhesion of polished marbles, at first attributing it to atmospheric pressure, but afterwards finding out his error, he relinquished that idea. At that time, the explanation given by philosophers of the rise of liquids in capillary tubes, was either founded on a supposition, that the atmospheric pressure *within* the tube was less than *without*, owing to the narrowness of the bore, or that there was a subtile fluid, which, flowing from the bottom to the top of the tubes, in a silent whirlpool, carried the liquids in its vortex; both these hypotheses were rejected by Newton, on considering that, in every case, the amount of rise, ought to be in an inverse ratio of the specific gravity of the liquid. So, whilst philosophers vainly tried to find, in agents exterior and invisible, the true causes of the phenomenon, this very cause existed in the tube they held in their hands, and depended on that kind of attraction designated by the name Attraction at Small Distances. Newton, after several erroneous guesses, came to this conclusion, whilst other philosophers were yet tardy to acknowledge the truth, willing rather to attribute all the phenomena to the unknown pressure of some spiritual fluid, or the vortices of some subtile matter. This was the last refuge of the vortices of Descartes, which after being banished from the celestial regions, sought to maintain themselves in those recesses of nature, where attraction, reproduced under another form, disputed the place with them. Succeeding philosophers have seen reason to attribute the whole class of phenomena to the same cause, and only differ as regards the mechanism by which all the effects are produced. (Hauy.)

With very little exception, nothing has been effected since that time to determine by experiment, the true nature of this attraction; and, indeed, I do not see how it was possible to come at the truth, without every aid that science, as it now stands, can afford. Capillary attraction having fallen into the hands of mathematicians, several of the most distinguished paid considerable attention to it. Of all these geometers, Clairaut alone came to one conclusion of vital importance, which I shall endeavour to indicate.

It has been already noticed, that whilst water and other liquids rise in tubes of glass, mercury experiences a corresponding depression. At first sight it might appear, that if the rise of water is in consequence of an attraction between the glass and that liquid, the depression of mercury might be attributed to a true repulsion, and this receives some colour from the fact, that liquids which can *wet* solid tubes, rise in them; but if they are unable to *wet* them, they fall. Thus water will wet glass, but quicksilver will not. Clairaut found, however, that both the rise and fall of liquids, are due to attraction, as compared with the adhesion of the fluids. He found, that if the mutual attraction of a solid and fluid, amount to less than half the cohesion of the latter, there will be a depression; if it be

equal to half, the liquid will stand level in the tube, and if it surpass the half, the liquid will rise.

As other theories have disappeared before that of Clairaut, it, in its turn, disappeared before that of the Marquis Laplace, and that of Dr. Young. I do not stay now to determine whether we are to consider the bounding meniscus as elastic surfaces, acting by their tension, which was the doctrine of Dr. Young, or whether, with Laplace, we are to attribute the rise or fall of liquids, to the attraction of a thin layer of liquid, immediately adjacent to the sides of the tube. The latter, I believe, will be found most agreeable to the general tenor of my experiments.

At a particular time of the year, a phenomenon takes place throughout all the vegetable world,—this is the rise of sap,—which is immediately connected with the budding, blossoming, and flourishing, of trees, plants, and flowers. In the months of April and May, if we cut asunder a vine branch, at one blow with a sharp axe, we shall perceive that the wood is nothing more than a vast collection of capillary tubes, from the wounded extremity of each of which, there runs a limpid water. By cutting the stump shorter and shorter down towards the ground, we shall find that it proceeds thence. On the 20th of April, I cut asunder at one blow with an axe, a vine of about one inch and a half in diameter, at about eighteen inches from the ground, and placed a vessel to receive the tears, covering the arrangement with branches, to protect it from the rays of the sun. The thermometer stood at 109.2° Fahr. in the sun, and 80.7° in the shade. The barometer 29.92, and the time of the day twenty minutes before ten in the morning. In the course of eight hours, the barometer had risen .1 inch, and the thermometer having fallen to 76°, the liquid was measured, and seventy ounces were found in the vessel. More would doubtless have been collected, but the extremities of the tubes were covered with a gelatinous matter, which choaked them. This fluid had a vegetable taste. Through a powerful microscope, no animalculæ, or signs of life, could be found. There were, however, a number of semi-opaque bodies, some of a globular, and some of an ellipsoidal form, smaller in diameter than the capillary tubes. In a few days these appeared to have putrified, and then the whole liquid swarmed with life.

This phenomenon, the rise of sap in trees, from its generality and importance, has long been studied. The nearest approach to ascertaining its true nature, was made by Dutrochet, who, relying on a certain galvanic experiment, and aided by the discovery of endosmosis which he had made, to which there will be occasion hereafter to refer, attributed it entirely to the action of electrical currents. The mechanism he designed was erroneous, but he was far in advance of any of his predecessors.

This was the state in which I found capillary attraction; my attention was first drawn to it during those tiresome moments of returning health, which follow an autumnal fever. Perhaps, if there be any merit in these experiments, it may hereafter be of service to some one to know, that they were begun in sickness, and in a land of

strangers,—they were pursued in all the calamity of family bereavement, and in the depths of forests, alike unused to music, to poetry, or to philosophy. Solitude, if it be conducive to the development of the intellect, and favourable to the exercise of thought, is likewise attended with many evils. Though no disturbance arises from the intrusion of the frivolous, yet the counsel and assistance of the wise are wanting, and, indeed, those advantages which are supposed to result from such tranquillity, are, for the most part, only fictitious appearances, which, like certain other apparitions, every one can discourse of, but no one can say he has seen.

My first experiments were made in regard to the rise of liquids in tubes, but it was soon found that this was too complicated a phenomenon, to offer any chance of detecting its causes. It might depend, as Laplace showed, on the positive or negative action of the bounding meniscus. Now the adhesion of plates of glass to the surface of different liquids, was allowed to depend on the same cause as the rise of those liquids in tubes of glass, and it was void of that complexity which enveloped the phenomena of capillary tubes. I first tried to assimilate the two, but quickly found that no positive conclusion could be arrived at in this way. For instance, there was a strong and variable attraction between mercury and glass, so that the pan of a balance required a very heavy load to detach them—but, mercury experiences a depression in tubes of glass.

Clairaut's theorem, however, will be found to reconcile these cases; it directly tends to prove that the force of attraction might even amount to more than the force required to separate a disk of glass from water, provided it could be proved, that the cohesion of mercury is double, or more than double that of water. I performed, again and again, the experiment of the adhesion of a glass plane to the surface of mercury, and found it was very difficult to make the valuation of the weight required to separate them, equal in any two experiments. Changes in barometric pressure, as determined by an excellent instrument, had no equivalent influence. Variations of temperature, seemed to exert a powerful effect on the adhesion, yet it was by no means uniform. The hygrometer sometimes afforded comparable experiments, and then again it gave conflicting results. However, after making a great number of these, and similar trials, I found that mercury chemically pure, which had sustained a long boiling, and disks of glass which had been kept for some time at a temperature approaching 500° Fahr. would, in a majority of cases, give identical results. But here again, if the glass were suffered to cool, if it was touched lightly by the finger, or if a particle of lead, or tin, or bismuth, was dissolved in the metal, the results were instantly discordant.

Hitherto I had had no theory or opinion to gratify, and I resolved to be led astray by no vain or crude notion, but making experiment the means, to regard truth as the *end*. I could not suppose these variations of adhesion by any means originated in alternations of the attractive force, but was obliged to suppose that they arose from disturbing causes, which acted at one period more effectually than

at another. To get rid of hygrometric humidity, I brought some mercury to the boiling point, and kept it so for some hours. It was then filtered, with the least possible exposure to atmospheric air, to separate any impurity which it might have contracted during ebullition. It was now suffered to cool down to 212°, and a clean plate glass disk laid on it, at the same temperature. The glass was insulated by a rod of gum lac, and the mercury contained in a cup supported by pillars of the same substance, an amalgamated wire proceeded from it, to the ball of a very sensible gold leaf electrometer; as long as the mercury and plate were in contact, the leaves of the electrometer hung parallel to each other, but on separating them, and it required considerable force to do so, a vast quantity of electricity was instantly developed, and the electroscope leaves were torn asunder by the violence of the repulsion. On carrying the plate of glass to another similar electroscope, by its insulating handle, the leaves diverged, and continued striking the sides of the instrument for several times in rapid succession. On examining the electrical state of the two substances. I found the mercury to be negative, and the glass disk positive. The electric equilibrium is therefore disturbed by the separation of glass from mercury. Whilst they are in contact there is indeed no development capable of being recognised by the electroscope, their electricity is at that moment disguised, and from theoretical consideration, it is easy to show, *that they must be strongly attracting one another.*

The next step was to consider whether other fluids, as water and alcohol, would act like mercury.

But, without trying any experiment, it might be predicted, that there are certain fluids so constituted, that the attractive force exerted between them and glass, may exceed the cohesion they have for themselves. Now suppose, on laying a disk of glass on the surface of water, the disguised electricity, caused an attraction between the two substances, greater than the cohesion of the water, the result will be, that the weaker force must yield to the stronger, and on lifting the glass up it will carry with it a thin sheet of water, held on its surface by the attractive force of the opposite states of electricity, which will be still disguised, and therefore the electroscope ought not to diverge. *All which is entirely conformable to experiment.*

As this position has a very near relation to the theory of Clairaut, I endeavoured to prove the truth of that experimentally. For this purpose, I took a glass disk of a certain size, and one of copper of the same dimensions, carefully and thoroughly amalgamated; it was washed in distilled water, and made quite dry. On one side, three small rings were fastened, for the purpose of suspending it horizontally from the arm of a balance. It was gently lowered on the surface of pure mercury, in a cup, and the weight required to overcome the adhesion, noted. This weight was regarded as measuring the cohesion of mercury. After each separation, the superfluous mercury was cleared from the disk; fresh mercury was used each time.

Exp't. 1.	54	Weight required to overcome the cohesion of mercury.
2.	53.89	
3.	54	

The copper disk was now removed, and the glass substituted in its stead.

Exp't. 1.	24.9	Weight required to separate the glass.
2.	25.8	
3.	25.72	

Now on comparing these six experiments, it would appear, that in no case did the attraction of mercury and glass, amount to half the cohesion of mercury. And as mercury is depressed in capillary tubes of glass, the numbers ought, by the theorem of Clairaut, to be such as were found by experiment.

But, lest seduced by experiments which might simulate an appearance of truth into an incorrect theory, I resolved on making an experiment, which should be a severe test. This was to measure, with as much exactness as possible, whether the adhesion took place in exact proportion to the electricity developed. For if one kept pace with the other, that would be the strongest proof that could possibly be had, that one was the cause, and the other the effect. In making such an experiment we have many disturbing causes in play.

If a disk of zinc is laid on a surface of mercury, it will be evident that a separation cannot take place, without the greater part of the electricity escaping before the contact is finished, owing to the conducting power of the zinc. Hence the resulting number determined by the torsion balance, is vastly inferior to what it would have been had the zinc not been a conductor. But if we substitute a disk of glass, in place of the zinc, owing to the nonconducting power of the glass, all the electricity developed remains attached to its surface. Hence, the apparent quantity of electricity developed by the contact of glass and mercury, is vastly superior to the quantity developed by any metal and mercury, whilst in truth it may be vastly inferior. This conclusion, to which I am thus led, receives strong support from the case of a galvanic battery, and a common electrical machine, in which the quantity of electricity developed by the former is much greater than that of the latter. If the contact could be broken before the electricity developed on the surface of the zinc was neutralized, by meeting with the opposite electricity on the mercury, then we might make correct estimates of the quantity of electricity developed by contact. Now, upon making the experiment, it will be found impossible to separate the touching surfaces from each other *at once.* Suppose, for instance, a disk of zinc was partly separated from the surface of mercury, if, by the strong attraction existing between the two bodies, or other causes, the parallelism of the touching surfaces was disturbed; or if a mere filamentary drop of metal, caused a momentary communication, all the free electricity of both surfaces, would in a moment be neutralized, and the resulting quan-

tity, either as measured by the torsion balance, or the gold leaf electroscope, is merely the residuum of the very last point of contact.

This observation applies to the fundamental experiment of Volta, of the development of electricity between a plate of zinc and one of copper. If the disks could be separated, before any of the contrary electricities had time to combine, much better proof would be had of Volta's assertion. A disk of iron, laid upon mercury, showed but little electricity; a disk of zinc still less; but the electricity developed by glass was apparent, owing to the nonconducting power of the glass. Instead of doubting whether electricity is excited by contact, it is much more unlikely that it is excited by friction, which, indeed, amounts to no more than a series of successive contacts. Some may, however, object to the whole theory of electricity developed by contact, and may quote the experiments of De la Rive as decisive of the question; but I would ask such, how are we to account for the development occasioned on the surface of a disk of glass, a substance not liable to chemical action? Besides, I am satisfied, from personal observation, that the chief experiment of De la Rive is erroneous. *He* may not have succeeded in producing any accumulation in his condenser, by the contact of zinc and copper in a jar of nitrogen, for the ablest philosophers cannot *always* succeed in so delicate an experiment, but, in many trials, I have done it, and am therefore satisfied in my own mind of the correctness of Volta's fundamental assertion.

With regard to the adhesion of plates to the surface of liquids, as keeping pace with the electricity developed, the terms in which that may be shown, may not be such as a rigorous measurement would give, but are such as the case admits. I took a disk of plate glass, of a highly polished surface, and on one side of it melted some gum lac, inclining the plate so as to spread the lac evenly over the surface. Whilst the lac was in fusion, a piece of plate glass was pressed down upon it, to give it a polished surface; but, as in separating it from the polishing glass, a splinter was torn from its surface, the numbers to be mentioned are rather too small for the lac. The disk was now suspended from the arm of a balance, to determine the adhesive force on the surface of pure mercury. First, with the vitreous side downwards, and then with the side covered with lac. The numbers were:

		Glass.	Lac.
Exp't. 1.	Perfectly dry	33.75	29
2.	Moistened by the breath,	40	30
3.	Wet	45.87	45.50

The second and third experiments were made to determine whether, when the surface was wet, a greater or a less weight would be required to separate them. From theoretical considerations, it would appear that the disks ought to adhere more strongly when water intervenes; for the rupture does not take place in consequence of the attractive force of the mercury and glass being overcome, but in consequence of the cohesion of the watery particles being overba-

lanced; this is evident, as a film of water is to be found on both surfaces; but in the last two cases, the theory would likewise indicate that the numbers determined by the balance were increasing, while those determined by the electrometer should be decreasing; and even in the last case the electrometer ought to be insensible. It may likewise be remarked, as connected with this, that the gum lac adheres less forcibly to mercury than glass, and only increases in adhesion when exposed to the same source of moisture, in proportion as one to three. Yet, when both substances *are wet*, the force of adhesion becomes the same, for then it represents the cohesive power of water. This experiment gives a salutary caution, that in attempting to compare the force of adhesion, with the electricity developed, every part of the apparatus and substances employed, ought to be free from moisture. If the proof plane of Coulomb be used, it will likewise be necessary to have regard to the conducting power of the surface under trial; without this precaution erroneous results would be obtained, arising from unequal distribution over the surface after separation; this, in circular disks, might vary from unity at the centre to 2.9 at the circumference, if the conducting power were perfect.

Having constructed disks of sulphur, beeswax, gum lac, sealing-wax, and crown glass, of exactly the same shape, weight, and dimensions, with the side that was to repose on the surface of pure mercury as highly polished as possible, I determined the adhesive force of each of these; the resulting numbers, the mean of several experiments, were as follows.

Crown Glass . . .	55
Gum Lac	50
Sealing-wax	50
Sulphur	45
Beeswax	20

The mercury experimented upon, had been three times distilled with care; a very dry day was selected, and after all moisture had been expelled by heat, the experiments were made in a vessel containing chloride of calcium. I satisfied myself of the absence of all electricity, by the test of an exceedingly sensible gold leaf electrometer. The results afforded by a torsion balance were—

Glass	18
Lac	16
Sealing-wax	15½
Sulphur	11
Beeswax	7

Although these do not bear the same proportion to each other, as the numbers in the preceding table, yet they follow exactly the same order. But fearing there might be some mistake arising from the construction of my torsion balance, I took a long magnetic needle, and furnishing it with a gilt pith ball, insulated by a filament of gum lac, I noticed the effect caused by the movable ball and proof plane.

The numbers reduced to the standard of glass, in the last experiment were—

Glass	18
Lac	16.2
Sealing-wax . . .	15.82
Sulphur	12.1
Bees-wax	7

I afterwards found that the same results might be obtained, in a rougher manner, by observing the distances at which each of the excited disks would affect a gold leaf electroscope.

The numbers thus found would probably agree better with those obtained by adhesion, if they were properly corrected. In the first place, the conducting power being variable in the different substances, will derange the result, and the expression for those in which it is greatest, ought to increase. There is another source of error, for which I see no remedy,—the attractive force exerted between glass and air; there can be no doubt, that air actually *wets* glass, and this is a circumstance of some importance to chemists. I have noticed in analysis of gaseous matter, traces of the presence of atmospheric air, which I am certain could be derived from no other source but this.

But if it cannot be rigidly proved that electricity is the cause of capillary attraction, by an exact correspondence of rigorous measures, such an opinion could be supported by no slight argument, if it was found that electricity exercised an apparent control over all the phenomena of capillary action.

Reasoning on the principle laid down, I succeeded in ascertaining in a distinct and positive manner, that electricity has complete control over chemical action, and that it can disturb the position of liquids in tubes, with the same ease, and quite as powerfully, as it can disturb the position of the magnetic needle. It might at first sight be supposed, that this could be effected by electrifying mercury, or water, in a capillary tube, furnished with a cistern, by means of a common machine; but a moment's consideration would show that this is an error. Owing to the expansive force of the electric fluid, it will, as is theoretically shown, occupy only the extreme part of the arrangement, and from this circumstance no particular result could be reasonably expected. Hence, though water be electrified in this manner, until it gives out sparks an inch or two long, it will remain in its original position in the tubes, even though the finger be approached very close to it. It is immaterial whether the electricity be positive or negative, or whether mercury or water be employed.

But whilst electricity of tension only affects the surface of bodies, electricity produced by the galvanic battery, occupies itself with their constituent atoms. It is from this source we must look for the effect. Now, if water be placed in a tube by itself, and the terminal wires of a galvanic battery being immersed in its extremities, it showed no disposition to be affected, the reason would be obvious; the attraction of capillarity is between the water and the glass tube, whilst

the electric current passes down *through the water*, without at all interfering, so as to alter the position of the suspended fluid. From this it is evident, that the tube must communicate with one pole of the battery, and the suspended liquid with the other. Further, the tube and the liquid must not only both be capable of conducting electricity, but it is also essential, that their conducting power should not be the same, or the electricity will pass from one to the other with too great velocity to cause any disturbance. To meet all these requisitions, and likewise to observe the reaction upon the capillary tube, I took a tube of glass, one-tenth of an inch in diameter, and wetted it thoroughly with water; I then placed it in a cup containing mercury and distilled water. The water rose in the tube; and on lowering it into the mercury, the mercury experienced its usual depression. The apparatus might now be regarded as a tube of water, containing mercury depressed in it by capillary attraction. I now made this tube of water positive by uniting it with a battery of fourteen Wollaston plates, and on making the mercury in the cup negative, the mercury in the tube instantly rose.

The only form in which the experiment will succeed, is when the positive pole dips into the *water* of the capillary tube, *and not into the mercury*. It is immaterial whether the negative pole dips into the mercury, or the circuit be completed elsewhere.

Some might incline to suppose, that as the rise takes place from the negative to the positive wire, it might receive ample explanation from the fact, that the electric current passing in the same direction, carries it mechanically with it. If the effect depended on this cause, the position of mercury ought to be deranged, by the passage of a stream of electricity from a common machine, but this is not the case; for strong explosions from a Leyden phial, may be passed in either direction through the tube, even at the risk of bursting it, and the position of the mercury will still remain unchanged. But the most decisive experiment is this,—if a positive platinum wire pass down the axis of a capillary tube into the water, and the tube and its wire be very cautiously elevated, whilst the mercury communicates as before with the negative wire, *at a particular position*, the water will experience an instantaneous depression, and will fall in the tube the whole length of the platinum wire. The particular position is, when the immersed extremity of the tube has just quitted the surface of the mercury, and the effect arises from an increased attraction between the mercury and the water. When a copper wire from the galvanic battery dips into mercury, it becomes wetted, and the mercury rises with a wave-like motion. But as in most other molecular actions, the phenomena are very complicated, the mercury having risen on the wire, capillary attraction, strictly speaking, is at an end; the mercury overcoming the attraction of the wire for itself. Change of capacity for caloric is the immediate result of change of composition, and heat is either absorbed or developed.

I have said, that, in the arrangement pointed out, a rise takes place; I would not, however, be understood to mean that such is always the case. That rise may be converted into a fall, and still all the

reasoning will apply. All that results from the theoretical action of a battery, is an increased pressure. This, under the control of disturbing causes, will produce a motion, but the direction of that motion is entirely governed by circumstances.

Before proceeding to the converse of this experiment, to show the depression of liquids, I may observe, that all these changes of position are accompanied by certain and definite changes of figure of the bounding surface. It appears, from the theory of Laplace, that an increase of attractive force ought to be accompanied by such a change of figure; which is the result of an equilibrium of the variable attractive force, and the cohesive power of the liquid. Reasoning upon these principles, it would appear that as the attraction between water and mercury increases towards equality, with the value of half the cohesive force of mercury, the bounding surface becomes of a less curved figure, and a rise takes place. From being convex upwards, as the surface approaches horizontality it becomes plane, and finally ends in being concave. That a rise ought to take place is shown by Laplace; for suppose the chord of the arc given by any section of the meniscus, to remain constant, the curvature of the arc becomes more and more sensible, forming a greater part of the circumference, whose radius becomes smaller and smaller, at the same time, the number of molecules contained on the bounding surface increase, and by a necessary consequence, the action of the meniscus itself increases; we may therefore assume, that, if a variation of the attractive force produces a change of figure, change of figure *may* be a legitimate indication of variation in attracting force.

In reversing the former experiment, so as to cause wetting liquids to rise higher, and mercury to be depressed beneath its usual level, regard must be had to disturbing causes, which may arise from the chemical nature of the liquids. A descent of mercury may be caused by altering the connexion of the polar wires. The mercury which, in the former experiment, was made negative, is now to be made positive, but as soon as this is done it becomes covered with a coating of oxide, which blocks up the tubes, and prevents any decisive action. Liquids capable of dissolving the oxide must be employed, and with sulphuric acid the rise and fall take place, on altering the communication. The simultaneous ascent of mercury, and descent of water, is instructively shown thus:—Place two plane plates of glass parallel to each other, so that there may be communication from their sides, with mercury and water in a reservoir. Make the water positive, by means of a platinum wire extending into the space between the glasses; on making the mercury negative, it immediately rises between the plates, and the water falls through the open sides, carrying with it any small particles of dust, or other light substance, placed there to show the path of the current. On breaking the communication, the currents return, flowing backwards, and things remain as before making the experiment.

It might here be objected, that no motion whatever ought to take place, from the elements laid down, the water having just as much tendency to descend as the mercury to rise; for, from the very nature

of disguised electricity, the positive and negative electricities are in the exact ratio for neutralising each other, which ratio is that of equality; an increased pressure only ought to take place.

This objection is easily obviated, when we remember that water and mercury differ in many respects; for instance, the inertia of the one is greater than that of the other; their action on the glass which included them, is very different, and all these things are to be considered as modifying the effect. On electrifying two substances, these trivial circumstances exercise a powerful influence, and may even determine a motion in direct opposition to what it ought to be. To chemists this is no new doctrine; these very forces, acting on this very electricity, determine so many chemical changes in direct opposition to affinity, else how can we give an explanation, that iron turnings decompose water at a red heat, and at the very same temperature, peroxide of iron is decomposed by hydrogen gas.

Aided by these considerations, I have contrived an arrangement to illustrate them experimentally. It consists of an inverted syphon, one of whose legs may be about one-tenth inch in diameter, and the other one-half inch. Mercury is to be poured into the syphon, until it rises in the smaller leg; pour upon it, in that leg, sulphuric acid; make the acid positive, and the mercury negative, and instead of a rise, a fall takes place. Change the communication, and there is a rise.

It may be remarked, that this alternation of rise and fall is decisive of the idea, that motion is produced by the mechanical action of the current; if that were the case, the motion in both instances should be alike, if the direction of the current was the same in both cases. I took the unequal legged syphon, filled with mercury and sulphuric acid, and caused the current to pass in its course along the wire of a galvanometer. The sulphuric acid was now connected by a wire passing from it, to one of the galvanometer cups; the mercury in the wide leg, had a thick amalgamated wire dipped into it, which proceeded from the negative pole of the battery. On completing the communication by a similar wire from the positive pole, the galvanometer needles traversed west. On reversing the communication, the mercury rose, and the needles traversed east. On substituting spring water for the sulphuric acid, and making the water positive, it instantly fell, vibrating about its lowest point of descent, and when it rose, vibrating about its highest. It is to be remarked, in making this experiment, that when the mercury is rising, the watery tube moves with a waving motion, between the glass tube and the mercury, and if the battery be in sufficiently vivid action, and the tube small enough, it will pass down, in direct opposition to the laws of hydrostatics, by several inches of mercury, and make its appearance in the other leg of the syphon.

I now took a syphon, whose legs were of equal diameter, and having made the water positive, and the mercury negative, there was a rise, the needle traversing west. On reversing, and making the water negative, the mercury blackened the tube, but did not move, the needles going east. Now, connecting this and the last experiment,

we find in one a current deflecting a needle westward, causing a rise, in the other, a fall. This I take to be proof sufficient that the mere motion of a current, dragging the mercury in its path, is quite unequal to produce the phenomena.

Perhaps some may imagine that a reasonable account may be rendered of this rise and fall, on chemical and hydrostatic principles. In the case where mercury rises in straight tubes, hydrogen gas is freely developed from its surface, and though most of the volatile metals are prone to form combinations with hydrogen, as tellurium, potassium, and arsenic, it, nevertheless, does not follow that these compounds must be gaseous: for instance, the solid compound of hydrogen and potassium of Gay Lussac and Thenard, and a similar compound of hydrogen and arsenic, formed by Davy. If, it may be said, an union of this nature took place between mercury and hydrogen, and the resulting compound was soluble in metallic mercury, it would, in all probability, be specifically lighter than mercury, as is the case with the ammoniacal amalgam; and on its formation it would disturb the hydrostatic equilibrium in the syphon, and a rise must take place to compensate for such disturbance. In the case where the mercury falls, why may not the hydrogen escape, and the oxygen unite either with the water or the mercury. Now from Dulong's experiments it appears, that the oxide of hydrogen is soluble to a certain extent in mercury itself, and peroxide of mercury is of greater specific gravity than water. Either of these suppositions, would account for a movement in the branches of the syphon.

In the first case, where a compound of mercury and hydrogen is assumed to be the cause of a rise, I would merely remark, that we have no warrant for supposing any such compound can be formed, and generally to the whole objection I make this reply,—The rise takes place *in a moment*, the instant the current passes, so that there is not sufficient *time* for any compound to be formed, at least not to an extent sufficient to disturb the hydrostatic equilibrium. Again, in the case of a rise in a tube of pure water, it is evident, after the current has ceased to pass, the mercury ought either to remain suspended, or slowly to disengage hydrogen whilst sinking. Now neither of these results agrees with observation; the moment the current ceases, the hydrogen drops, without disengaging the minutest bubble of gas. In repeating this experiment, care must be had that the water is pure, or at least only rendered a sufficient conductor, by substances which contain no alkaline matter; for instance, if chloride of sodium be present, the resulting amalgam will disengage hydrogen for some time after the current has ceased to pass; but even in this case, sufficient evidence may be had against this objection, for the sinking of the mercury is almost as instantaneous as its rise, and it is not until after *it has fallen,* that the disengagement of hydrogen is perceived. Again, if oxide of mercury be the cause of the fall, it should be remembered that the fall ought to be permanent. And as to peroxide of hydrogen, it is a substance so notoriously liable to decomposition, and requiring so large a volume of oxygen for its forma-

tion, that I cannot for a moment conceive any possibility of its presence at all affecting the experiment.

Again, it may be doubted, whether the current itself, or some peculiar quality of it, is the cause of these phenomena; or whether they do not arise from the electro dynamic action of the wire upon currents traversing the mercury.

On approaching a strong bar magnet in any position with regard to the apparatus, no disturbance ensues, and the poles of a powerful horse-shoe are equally inert. A battery consisting of a few large plates, though it will make the galvanometer needles turn violently round, will by no means cause that change of level, which a number of smaller plates will occasion. It therefore requires that peculiar voltaic arrangement, which is exactly suited to chemical effects. A larger number of moderate sized plates, has the most energetic action. Hence another important inference may be drawn—if, as we see the same arrangement controls capillary attraction, that is most effectual in disturbing affinity of chemical action; and if chemical attraction is identical with electricity, then there is great reason to suppose capillary attraction is referable to the same cause.

The evidence which it was my intention to bring forward, to show what strong suspicions there were for supposing that capillary attraction is due to electricity, may be regarded as complete; but a number of arguments might be adduced in addition. I would ask, what better proof have we of the truth of any scientific theory; we see that all the phenomena of capillary action may be legitimately accounted for by the laws of electricity; we see that the measure of the one is the measure of the other; that when the one increases or decreases, so does the other, in the same proportion, and that the one has that control over the other, that a cause might be expected to have over an effect. But lest, deceived by specious appearances, we should form an erroneous opinion, let us see how new facts will elucidate the matter, holding ourselves ready to forsake any theory, however plausible it may appear, the moment we find one fact that contradicts it. In doing this, I have to require a distinction to be made between things that *cannot* be explained on these principles, and those that I am unable to explain. For in treating on an intricate subject like this, where the actions of that unaccountable agent Electricity, are deeply involved, it would be vain entirely to rely on my humble ability. There was a saying of old, that it required a clever charioteer, to turn his horses in a narrow chamber,—how then shall I hope to guide such an ungovernable steed, and grope the way in darkness?

I believe it was Sir H. Davy who first noticed the convulsions of mercury, when electrified under water. In a watch glass, I placed about an ounce of mercury, and poured on its surface water, rendered a better conductor by a drop of sulphuric acid. The mercury was now made negative, and on dipping the positive pole of the battery into the water, a rotary motion was produced, exactly similar to that which would be exhibited by a current passing from a blow-pipe over the surface of the water. Now, it is to be remarked, that the arrangement is the same as when mercury rises in a straight capillary

tube; the mercury in both cases is to be in connexion with the negative pole. On reversing, and making the mercury positive, no motion is produced in either case.

As the battery I made use of in all these experiments, consisting of fourteen three inch Wollaston plates, was much too powerful when charged in the ordinary manner, I poured the exciting fluid from the cells, and replaced it by water rendered slightly saline by common salt. The action of the battery was now much moderated, and I observed, on repeating the experiment, that on making an arrangement as described, for producing currents, the mercury suddenly became more globose. On breaking the communication, it gradually dilated again, becoming a very oblate spheroid, much flattened at the upper part. At the time of its greatest convexity, a slight current was seen, carrying light bodies in its vortices, and betraying the energetic gyrations, which the particles of the mercury were accomplishing, whilst the little globule was detained, in such a state of force. On reversing there was a motion produced. It is easy to show that this change of figure proceeds from a change in attractive force of the bodies in contact. I made this experiment in another manner; I took a glass tube of such a diameter, that it would contain a little acidulated water, and a globule of mercury, without the spherical figure of the latter being deformed. In the bottom of the tube, a platinum wire was sealed; this the mercury reposed upon, and it likewise served to communicate with the negative end of the battery; on passing the current an instant deformation of figure took place. The upper surface flattened, and the mercury touched the tube all round, in a complete ring. Its surface was ploughed by gentle currents, and in the thin aqueous tube thus formed, decomposition rapidly took place.

Let us pause, to make a few useful applications of the knowledge we have acquired. Nearly one hundred and fifty years ago, Huygens saw with astonishment, that in a tube of a few lines in diameter, mercury might be made to stand at the height of seventy inches. This phenomenon is constant, when the interior of the tube is quite dry, and the mercury desiccated by long boiling. It receives an explanation on these principles. When the mercury is made to descend, in a dark room, to its usual barometric height, the vacuum is pervaded by a lambent electrical flame. This phenomenon takes place, to a greater or less extent, in all barometers; those that are most free from moisture and gaseous matter, being most liable to it. In tubes of a large diameter, it is manifested by an adhesion of mercury to the tube, which must be overcome by tapping the case of the instrument, or other mechanical means. I took a tube four-tenths of an inch in the bore, and having made it perfectly clean, I exposed it to as strong a heat as it could bear without altering its figure; whilst it was hot, one end was sealed, and the other bent like a syphon barometer. Mercury which had been distilled three times, at a low temperature, and then made to boil violently for a few minutes, was poured into it; it was again boiled for rather more than four hours. The adhesive force of the mercury to this tube was remarkable; it could never be

brought to stand at the same altitude, in two consecutive experiments. The slightest motion filled the tube with a pale electrical flame.

On the same principle may be explained an experiment, made by P. Abat, which has not a little puzzled philosophers. In a syphon, whose branches are of equal diameter, pour some mercury, so that its height in both branches may be equal. Make the mercury rise in one of the legs by inclining the syphon, and then slowly return it to an upright position; the mercury will now stand higher in the branch in which it rose, the hydrostatic equilibrium being destroyed. From the principles laid down it is plain this should be the case. When the syphon is brought to its greatest inclination, the tendency of the electricity developed by the contact of glass and mercury, is to produce a species of adhesion, and if the motion in restoring the syphon to its former position be gradual, that adhesion has time to take effect.

Dutrochet, I believe, for I have not yet seen his original work, saw that endosmosis might receive an explanation from the action of electrical currents, founded on a galvanic experiment, made many years ago. Circumstanced as I am with regard to his writings, I cannot criticise them. If, however, he supposes endosmosis is due to electrical currents, I submit that it is an error. For it appears, that a very simple explanation may be given. The liquid, whatever it may be, that has the greatest attraction for the bladder, or other porous substance, passes through by common capillarity; as soon as it reaches the upper surface of the system of tubes, it unites with the other liquid; in the case of alcohol and water, for example, the water passes through, and unites with the alcohol: this compound has not the same force of capillarity as the water alone, consequently the water still continues to rise, its upper surface being in a manner removed, by uniting with the alcohol, just as the sap continues to rise in trees, as the upper end of each filamentary column is removed, by evaporation from the surface of the leaves.

Setting out with these ideas, I attempted to determine the matter experimentally. I stretched a disk of bladder over a light metallic ring, and suspended it horizontally in equilibrio from the arm of a balance. The liquids experimented on, were taken from the same phial as had been used for verifying the endosmosis—they were, distilled water, proof alcohol, and a mixture of each. I expected that by ascertaining the force required to detach the bladder from them, I should know their comparative cohesion. From other circumstances I knew that the ratio of the electricity developed by alcohol and bladder, and by water and bladder, was something less than that of six to ten.

		Alc.	Water.	Mix.
Exp't. 1.	Force required to lift a disk of bladder from	20.1	33.4	23
2.		20.1	33.1	23
3.		19.8	33	23

It appears that the water passes through bladder with a force represented by 33; whilst the alcohol only attempts the passage with a force represented by 20; of course, the greater pressure prevails, and

the water passes. On arriving at the other side of the bladder, it forms a compound with alcohol, and the backward pressure now amounts to 23. The water, therefore, still continues to rise. I have used these numbers, in a rough manner; they do not accurately express the forces, but are a sufficient approximation for the purpose of illustration.

Guided by these principles, it appeared to me, that a material improvement might be made on the common galvanic battery, if the electricity developed during the mutual diffusion of liquids into each other, was added to that developed by two metals, acted on by a chemical menstruum. To put this into practice, I made an arrangement in a glass tube, half an inch in diameter, consisting of two metallic coils, one of copper and one of zinc, to each of these a copper wire was soldered. The zinc coil was at the bottom of the tube, through which its copper wire passes, being made water tight with gum lac. The copper coil was situated at the upper extremity, and about one inch distant from the zinc. Now on putting a strong solution of muriate of soda in the bottom of the tube, and dilute muriatic acid, of less specific gravity, at the top, during the act of diffusion of these liquids into each other, a strong current of electricity, it was presumed, would pass along the connecting wires. It was with no small pleasure I observed a full corroboration of the truth of the principles on which I was reasoning; for on introducing the poles into a drop of water, instantaneous decomposition ensued with considerable energy.

A plate of zinc, one-eighth of an inch in width, and half an inch long, fitted with a similar copper plate, by the aid of the solution above referred to, is perfectly adequate to the decomposition of water. A battery of half a dozen such tubes, bears a favourable comparison with one of fifteen Wollaston plates on the old construction.

In continuation of this research, on the power that one substance possesses of penetrating into the pores of another, as nearly measured by their power of cohesion, I was led to repeat the experiments formerly made by Guyton De Morveau, on the adhesion of disks of metal, to the surface of quicksilver. The results were—

1 Gold	6 Zinc
2 Silver	7 Copper
3 Tin	8 Antimony
4 Lead	9 Iron
5 Bismuth	

Which is likewise the order of their affinity,—another proof that chemical affinity and capillary action, are to be attributed to the same cause.

In repeating these experiments, I had occasion to notice incidentally, the production of heat, the moment mercury was touched by gold. This remark was made many years ago by Boyle, as may be observed in his essay on the Mechanical Origin of Heat and Cold.

It might be predicted, from the experiments of Pouillet, that gases must exhibit the same phenomenon. A piece of red hot charcoal, when I had cooled it in mercury, and then immersed it in an atmosphere of ammoniacal gas, had its temperature suddenly raised. When it was surrounded by a mixture of atmospherical air and hydrogen gas, and

the temperature slowly raised, the heat developed by the charcoal was such, that it set fire to the gaseous mixture, acting in the same manner, though not so energetically, as spongy platinum would have done.

This principle offers an explanation of the decomposition of the peroxide of hydrogen, and persulphuretted hydrogen, by several substances which have no chemical action on them. These compounds only exist at certain low temperatures, for a heat much short of 212° Fah., entirely decomposes them. The metals, and metallic oxides, likewise act in a very energetic manner; I am now speaking of the peroxides, which do not pass to a state of higher oxydation, during the action. On dropping any of these into a tube, containing peroxide of hydrogen, an instantaneous explosion ensues, and the tube becomes hot. The decomposition takes place, in consequence of the heat disengaged by capillary action; at least, the heat which must of necessity be developed from that cause, would be sufficient to decompose the layer of peroxide of hydrogen, immediately reposing on the oxide, even if no other disturbance was in action. And agreeably to this, we find, that in many cases oxide of silver will be reduced itself, whilst it is reducing peroxide of hydrogen.

There is a point, in connexion with this, to which I would refer. A liquid cannot repose on the surface of a solid, without the disengagement of caloric. A gas cannot pass through a capillary tube without changing its temperature. Hence, in the phenomenon of endosmosis, of liquids and gases, the membranous partition is of necessity obliged to undergo a change of temperature. For this reason it is well worth the inquiry of physiologists, whether animal heat may not in a measure be traced to this source. It is impossible that such changes as take place during respiration, should proceed without exaltation of temperature, but it is equally impossible, that the phenomenon of endosmosis, taking place at every breath we draw, should proceed without exaltation of temperature in the membranous septa of the lungs, and the whole vital apparatus. From Dulong's researches it appears that, supposing all the oxygen that has passed into the state of carbonic acid, has really combined with carbon during respiration, and supposing all the oxygen which has disappeared has combined with hydrogen to form water, and that the sum of these two quantities of caloric, accurately represents the whole quantity of heat produced by the chemical changes of respiration, the amount is too small by one-tenth, and often by two-tenths, of the actual quantity.

I might now proceed to add something concerning those chemical decompositions, which may be effected by the mere action of capillarity, as exemplified in the cases of deutoxide of nitrogen, atmospherical air, and pure ammonia; and likewise to show how much these processes are controlled by the condensation of those gases. I might likewise speak of those molecular motions, which silently take place in the innermost recesses of solid bodies, and indicate the laws of the movement and equilibrium of those systems of atoms. For we are not to suppose, because the texture of solid bodies appears to be the same for many years, that there is no movement of their consti-

tuent parts. I might proceed to consider the magnitude and shape of those atoms, and how one system of them may be made to disturb the motions of another; the distance there is between atom and atom, and how it is affected by their orbital paths, and vibratory oscillations. I might show how the disguised electricity, produced by near approximation, acts on these elementary systems as a centripetal force, and how the caloric which is produced under these circumstances acts as a counterbalance to prevent their fall on each other. But so long as hypothetical considerations are involved in these researches, and until the geometrical investigation is corroborated by extensive recourse to experiment, we cannot hope to come to an undoubted conclusion.

If we look once more on the mass of evidence which appears, we shall find, that all the phenomena of capillary action may be explained according to the laws of electricity,—that electricity is produced in some of the chief cases of capillary attraction, its development keeping pace with the intensity of attraction. We shall find, that whatever disturbs the production of the one, disturbs the action of the other. That the formulas of Clairaut, developed many years ago, receive, upon this doctrine, experimental corroboration—and that the attractive force may be measured by the torsion balance. If further proof were wanted, we should find it in the complete control the galvanic battery has over the height of a column, whether of mercury or water, suspended in tubes, making it rise and fall at pleasure; and, what ought to be an argument to a chemist, this is done by that arrangement which effects that affinity, which is said to be due to electricity. The endosmosis of Dutrochet is explained, not hypothetically, but by recourse to the balance; and to show that we may employ this theory to advantage, it has proved a guide for discovering arrangements in galvanic batteries of unusual intensity. It is found that the electrical excitements of different metals and mercury, as determined by their affinity, keep pace with their capillary action. The singular evolution of heat produced by molecular action, affords another passing proof to that type—the polar connecting wire of a voltaic battery. The physiological application of this fact, is striking and important; and if any thing be wanting to complete the chain of evidence, it may hereafter be found in the power that capillary attraction possesses over chemical affinity.

Christiansville, Va., July, 1834.

FRANKLIN INSTITUTE.

Quarterly Meeting.

The forty-second quarterly meeting of the Institute, was held at their Hall July 17, 1834.

Mr. Jno. C. Cresson, was appointed Chairman, and

Mr. Samuel Hufty, Recording Secretary, P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books, models, and minerals, were received from Messrs. M. W. Baldwin, M. D. Lewis, Timothy Abbott, jr., Edward

G. Dorsey, James J. Barclay, Zac. Allen, Samuel Breck, James Ronaldson, Jos. S. Kite, John Skirving, Lieut. Chas. Gauntt, U. S. N.

The actuary laid on the tables the various periodicals which had been received during the last quarter.

The chairman of the Board of Managers read the forty-second quarterly report, which was accepted, and referred to the committee on publications.

The Treasurer made his report of the funds of the Institute for the quarter ending June 30th, which was accepted.

On motion, the conversation meetings of the Institute, were directed to be suspended for the months of July and August.

The Board of Managers, in their quarterly report read this evening, reported that a letter had been received from M. De Moléon, of Paris, France, accompanied by a diploma of membership from the Sociétié Polytechnique, in that city, certifying the election of the members of the Franklin Institute, to be corresponding members of that society, —when, on motion, the corresponding secretary was instructed to acknowledge the receipt of the letter, and return the thanks of the Institute to the Société Polytechnique.

Extract from the minutes.

John C. Cresson, *Chairman.*

Samuel Hufty, *Rec. Sec. P. T.*

Forty-second Quarterly Report.

The Board of Managers respectfully submit to the Institute their forty-second Quarterly Report:—

The period that has elapsed since the last quarterly meeting, includes but a small portion of the active operations of the institution.

The Committee on Instruction having no schools under their charge during the spring and summer months, have directed their attention to other important objects connected with their appointment, and the Board feel assured, that when the period arrives for communicating instruction, whether by means of school, or lectures, this department of the Institute will be found efficiently organized, and the Board ventures to express the hope that it will receive, as it will unquestionably merit, the warm support of all the members.

The Library is rapidly increasing,—a number of valuable books having been added during the last quarter.

The Journal of the Institute continues to be an object of solicitude with the Board, and although increasing in extent of circulation, it needs the active exertions of the members to promote its interests. Its value to the mechanic is no longer a subject of theory, but is generally admitted wherever the Journal is known; that it should be more extensively known than it is at present, is certain, and this result can only be produced by the active exertions of those who are now subscribers. Men of science generally, as well members as others, are earnestly called upon to increase its usefulness by enlarging its circulation, thereby enabling its publication at a reduced rate. The liberal compensation made by the Committee on Publication to the authors of

original communications for the Journal, should induce mechanics to contribute more generally the result of their experience or observation.

The activity displayed by the Committee on Science and the Arts, shows the wisdom of the organization given to it by the Institute. Already forty members have enrolled themselves, and its stated monthly meetings have each been attended by more than thirty members. During the intervals between these meetings, the sub-committees examine subjects referred to them, and when not acting merely as counsel to inventors, submit detailed descriptive reports on the subjects examined. Those reports are discussed, in the general meetings of the committee, at which they are subject to revision, and the question is taken on their adoption by the general committee.

In relation to the rules and regulations for the award of premiums and medals from John Scott's legacy, now vested by our City Councils in the Franklin Institute, this committee have acted with promptness. The rules reported by them, and adopted by the Managers, are herewith presented.

The necessary publication of information to inventors, has been directed by the committee, and made by the Actuary of the Institute.

The committee of the Philadelphia Society for promoting agriculture, heretofore having charge of the Scott legacy, have transferred to the Institute all the models which were received, in consequence of the reference of that legacy to the Society by the City Councils. This is a subject of deep interest to the Institute, every mechanic doubtless knows the benefit to be derived from a good cabinet of models, to which he can at all times have free access. It is confidently believed that, with proper exertions on the part of members, ours may, in a short time, equal any other in the country. The Board feel constrained to bring this subject before the members, and to urge upon each the necessity of contributing all in his power to the accomplishment of an object so desirable.

Since the last meeting of the Institute, a letter has been received from M. De Moléon, Secretary of the Polytechnic Society of Paris, covering a diploma, by which each member of the Franklin Institute is constituted a corresponding member for life, of that Society. The diploma is herewith submitted. Among the benefits to be derived from this membership, the chief, perhaps, is, that the Polytechnic Society pledge themselves to give information to their corresponding members, in regard to mechanical subjects which may be objects of inquiry, and to have patents taken out for them.

The monthly meetings, of the proceedings of which the pages of the Journal contain regular reports, continue to gain favour with the members. The last was very well attended, notwithstanding the lateness of the season. The Board would recommend that the plan adopted last year be again followed this, namely, to dispense with these meetings during the months of July and August.

(Signed.) ALEXANDER FERGUSON,
Chairman.

WILLIAM HAMILTON, *Actuary.*

Committee on Science and the Arts.

The reports of the Committee on Science and the Arts having been referred for publication, the Committee on Publications deem it right to renew the notice of the constitution of that committee, and to present to the readers of the Journal, the mode of proceeding in regard to these reports.

The Committee on Science and the Arts was constituted at the suggestion of the Board of Managers, by the annual meeting of the Franklin Institute, the following resolutions having been adopted by that meeting:—

I. *Resolved*, That the Committee on Inventions, heretofore appointed by the Board of Managers, shall be extended under the title of the "Committee on Science and the Arts," and that the number composing said committee shall hereafter be unlimited.

II. *Resolved*, That the "Committee on Science and the Arts," shall consist of such members of the Institute as shall voluntarily enrol their names as members thereof, in a book to be prepared for the purpose, and who will, by enroling their names, pledge themselves to perform such duties, to be hereinafter described, as may devolve upon them, and to sustain, by their labours, the scientific character of the Institute.

1. It shall be the duty of that committee to hold periodical meetings at the Hall of the Institute, at such times as they may deem expedient, to enact rules for their own regulation, and to appoint a member to preside over their deliberations.

2. It shall be the duty of said committee to examine, either as a body, or by sub-committees, all inventions that may be submitted, and to make detailed, descriptive reports thereon, giving their opinion with candour and impartiality on the inventions submitted, in the manner now practised by the committee on inventions.

3. It shall be the duty of that committee to conduct by sub-committee, or otherwise, such scientific investigations as may be deemed worthy of consideration, and to publish the results in the Journal of the Institute.

4. It shall be the duty of that committee, by sub-committee or otherwise, to inquire and report into the state of the arts generally, or into the state of any branch thereof, when called upon to do so, in order to disseminate useful practical information, or historical facts, in relation thereto.

5. To that committee shall be confided, in general, the scientific duties which devolve upon the institution, tending to mutual instruction, and to the dissemination of knowledge, and which are not specially intrusted by the constitution to the officers of the Institute.

III. *Resolved*, That the said committee shall be governed in the expenditure of money by the same rules as govern all other standing committees, and it shall not be competent to them to contract any debts, until they shall have been authorized by an appropriation made by the Board of Managers, upon the requisition of the committee.

IV. *Resolved*, That it shall be the duty of the chairman of the "Committee on Science and the Arts," to report the proceedings of the committee to the Board of Managers, at least three weeks previous to each quarterly meeting of the Institute, in order that the information therein contained, may be included in the quarterly report; and to report to the Institute whenever directed so to do.

V. *Resolved*. That the chairman of the committee shall be elected annually, at the first meeting after the annual meeting of the Institute.

The committee organized on the 25th of February by the appointment of a chairman, and determined to hold stated meetings on the second Thursday of every month.

The following regulations for the transaction of business, were adopted at the same meeting.

Resolved, That, until further ordered, it shall be the duty of the chairman, to preside over the deliberations of the committee; to appoint sub-committees on all investigations that may be required of the committee, subject to their approval.

Resolved, That the chairman be empowered, during the recess of the committee, to appoint sub-committees on such inventions as may be presented for report or counsel.

Resolved, That all committees on inventions shall leave their reports with the Actuary, within one week after their appointment, unless such inventions require extended investigation.

Resolved, That no report shall be ordered for publication, until it shall have been adopted by the general committee.

Those of the reports of sub-committees, which, after adoption by the general committee, are by them ordered for publication, will appear from time to time in the pages of this Journal, attested, as directed by a resolution of the committee, by the Actuary of the Institute.

The Committee on Science and the Arts now consists of fifty members.

Com. Pub.

Report on Amasa Holcomb's Reflecting Telescope.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Reflecting Telescope, manufactured by Mr. Amasa Holcomb, of Southwick, Hampden county, Massachusetts,

REPORT:—

That the following is the description of the instrument as given by Mr. Holcomb.

"The telescope submitted to the examination of the Committee of the Franklin Institute is of the reflecting kind; has a focal length of six feet; the diameter of the speculum is three inches nine-tenths; the rays of light are reflected but once; the image formed in the

focus of the speculum is viewed by a common astronomical eye piece, or by a single lens; it has also an eye piece for viewing land objects, which shows them erect. The telescope is of the same construction as those of Sir William Herschell, the observer having his back towards the object and looking directly towards the speculum. It has an advantage over those of the Gregorian and Newtonian forms, by showing the object brighter with the same aperture, there being no light lost by a second reflection. The diameter of the speculum is small in proportion to the length of the instrument; it will bear a diameter of eight inches, with much advantage for viewing very small stars, in consequence of the great increase of the light.

The magnifying powers that are used are, forty, ninety, and two hundred and fifty."

Through the politeness of Prof. A. D. Bache, the committee were permitted to compare the performance of Mr. Holcomb's reflector with that of a five feet achromatic, of four inches aperture, by Dolland, the property of the University of Pennsylvania. The instrument was also compared with a three and a half feet achromatic, by Dolland, and with a Gregorian of four inches aperture, the mirrors of which had been lately repolished in London. The short stay of Mr. Holcomb in Philadelphia, prevented the comparison of it with reflectors in the possession of other members of the committee.

On the evening of the 14th of April, the committee met by adjournment in the open lot south of the Pennsylvania Hospital, the use of which was politely permitted to the committee by the managers of that institution.

The following were the results of the comparisons:—

The moon, nearly full, was too bright to be conveniently viewed with the lower powers of the instruments: with a power of 350 in the five feet achromatic, the moon appeared bright and well defined,—with the same eye-piece, giving a power of 400, in the reflector by Mr. Holcomb, the moon was sufficiently bright, and equally well defined. The same, with the exception that the moon was more brilliant, and the field of view much greater, was remarked with the use of Mr. Holcomb's highest magnifier, giving a power of two hundred and fifty.

As an illustration of their comparative performances, it was remarked that the waved appearance of the outer declivities of the craters of some of the apparently extinct lunar volcanoes, indicating the successive depositions of the lava, was more manifest with a power of four hundred in the reflector.

The immersions of 3 and 4 Geminorum of the sixth and seventh magnitude, were observed at the same instant of time in each.

The same occurred the evening before with a star of the eighth or ninth magnitude.

The immersions, however, of two very small stars, apparently of the ninth or tenth magnitude, were observed with difficulty in the refractor, but could not be observed at all in the reflector.

The companion of Polaris was best seen when the moon was up in

the refractor, but in the absence of the moon it was readily seen in both.

Castor was easily divided with the lower powers of either, but in the case of this, as well as of other binary and double stars, the dark space between the stars was less disturbed by scattering rays in the reflector than in the refractor.

ε Bootes was seen double in each, but more distinctly in the reflector, μ Draconis. γ Leonis, and 4th and 5th ε Lyra, were seen distinctly double in both instruments; μ Draconis, from the equality of the disks and softness of light, presented the finest appearance.

γ Virginis, with a power of three hundred and fifty in either telescope, gave no certain indications of being double. Some of the members of the committee were of opinion that it was slightly elongated.

It was stated by the artist that his reflector would divide stars distant 3″ from each other.

Estimating the distance of the stars observed by the late observations of South, and Herschel, jr., the committee were of opinion that his instrument is adequate to the distinct division of double stars distant from each other 2″.5.

The motion of this instrument, plainly mounted, was steady, and with the finder, even without rack work, objects were easily made to range with the centre, or line of collimation of the instrument.

The position of the observers with the Herschelian telescope, was natural and easy in contemplating objects having seventy or eighty degrees of altitude, though quite constrained and inconvenient in using the achromatic.

The reflector gave a distinct view of land objects, even when within one-fourth of a mile.

Some light was lost by the position of the head, an inconvenience partially obviated by making the end nearest the object three inches greater in aperture.

The Gregorian, which probably was not a very fine instrument of its kind, bore no comparison in distinctness, or in quantity of light, with the Herschelian telescope.

From these trials, the committee are of opinion that Mr. Holcomb has been entirely successful in the difficult art of polishing specula with the true curve, which gives to the objects viewed all the distinctness of figure that is given them by the best refractors manufactured by Dollond.

In one respect, the largeness of the field of view, the reflectors by Mr. Holcomb have a decided advantage over achromatics and reflectors of different construction. The apparent diameter of the field of view in the Herschelian being nearly double that of either, with equal freedom from aberration. The quantity of light furnished by the refractor was greater with the same aperture, an important advantage in searching for, and observing very minute objects. This deficiency of light in the Herschelian for viewing faint objects near the moon, or satellites near their primaries, the committee are of opinion may be removed by enlarging the aperture of the Herschelian reflector to five or five and a half inches.

The simplicity of the method of preparing and mounting Mr. Hol-

comb's telescopes is worthy of notice, since on this plan, the artist is enabled to furnish for an expense of one hundred dollars, with plain mounting, or of one hundred and fifty to two hundred dollars, with more expensive mounting, telescopes whose performance equals that of Gregorians and achromatics hitherto imported into the country at an expense of five hundred dollars.

By order of the committee.

May 8th, 1834. WILLIAM HAMILTON, *Actuary.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN FEBRUARY, 1834.

With Remarks and Exemplifications, by the Editor.

1. For a *Water Wheel*, denominated the "*Horizontal Sunk Curb Wheel;*" James Pilling, jr., Waterford, Saratoga county, New York, February 3.

This is to be a horizontal wheel with a vertical shaft passing up through a penstock. The cylindrical part of the wheel may be three feet in diameter, and a foot in depth; this is to be surrounded by wings, or buckets, either straight or curved, the cap or top plate of the wheel forming a circular cover, or flanch, which extends about half an inch beyond the extreme edges of the buckets. This wheel is to be let into a circular curb of wood, or of iron, which is to fit nicely, the projecting flanch forming a joint as nearly as may be water tight. The water is to be let on to the wheel, tangentially, through three or four openings in the surrounding curb, a circular channel being provided for that purpose, and each opening being furnished with a wing in the channel, to give the water a proper direction. The water, after acting upon the buckets, is to escape through openings in the bottom of the curb. The head of water acting upon the flanch, or horizontal rim, which forms the cover of the buckets, presses it upwards, and prevents all undue friction upon its centre.

The claim is to "the method of introducing the water upon, and discharging it from, the wheel, by the arrangement as above described. The combined arrangement of the curb and wheel, by which the latter is buoyed up by the water in its action upon the under side of the flanch, and the bottom step relieved from the friction, without any waste of water, loss of power, or extra expense of machinery."

This resembles other wheels for which patents have been obtained, although we are not aware that its exact likeness is to be found upon the files of the patent office. The mode of letting on the water, however, is not new, and the principle of sustaining the weight of the shaft and its appendages by the upward pressure of the water, has been repeatedly applied and variously modified.

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2. For an improvement in the *Mode of Building Bridges;* Jonas Snyder, Union county, Pennsylvania, February 3.

We do not perceive the points of novelty in the proposed mode of framing wooden bridges, but think that in its general principles, and

in the manner of arranging the various parts, it does not differ from such as are well known; the patentee has not put in any claim, but merely informed us of his mode of procedure. A good drawing accompanies the specification, showing very clearly the manner in which the timber is put together; our inability, therefore, to designate the points of novelty, does not arise from any defect in that part, but from their not being designated in the specification, as the law requires that they should be.

The bridge, we are told, is to be framed with double wooden cords, posts, about eight feet apart, running up from them to the plate, the posts being so set as to lean outwards each way from the centre. One, two, or more arches are then to be formed by tie braces which run from post to post, into mortices prepared to receive them, and in which they are confined by suitable keys. The lower of these arches is commenced on the end posts, against the piers, about four or five feet below the cords, rising in a regular arch through the whole of the posts. A second such arch may be commenced immediately above the cords. The floor is to be furnished with horizontal arches passing through its cross sills, forming braces, and keyed in the same way.

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3. For a *Thrashing Machine;* Theodore Smith, Enfield, Tompkins county, New York, February 3.

We readily admit this into the numerous family of cylinder and concave thrashing machines, a right which it may claim on the principle of precedent, which we are not, upon the present occasion, inclined to dispute.

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4. For an improvement in a machine for *Making Rovings of Hemp, Flax, or other fibrous substances;* Daniel Treadwell, Engineer, Boston, Massachusetts, February 3.

This patent is taken for a drawing head, to be used in drawing out the fibres of hemp and flax; it may be appended to the machinery carrying the hatchel and bobbin belts, formerly patented by Mr. Treadwell, or it may be added to other machinery for a like purpose. Were we to attempt to describe it without a drawing, we should not probably, succeed in giving an adequate idea of its construction, and shall therefore pass it over at present without further notice than to observe, that it appears to be well adapted to effect the important and difficult purpose for which it is designed.

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5. For a *Bee Hive;* Samuel Morrill, Dixfield, Oxford county, Maine, February 4.

Within a hive of the ordinary form and dimensions, there is to be a partition, or shelf, perforated with holes for the bees to pass through; over these holes are to be placed inverted glass tumblers, within which they are to form their combs. What the patentee claims as his invention is, "the use of glass tumblers in which to receive the honey, and the manner of preparing the partition plate." If the inventor of

this *novel* mode of collecting honey, were the possessor of all that article, and its accompanying wax, which has been obtained in similar glass vessels, he would have no occasion whatever to regret the entire worthlessness of his patent, as he might undoubtedly freight several large vessels with the contents of his store-house, and live comfortably on the returns for the remainder of his days.

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6. For a new *Machine to be used in Rope Making*, and which is denominated an "Iron Tail;" Daniel Treadwell, Boston, Massachusetts, February 5.

In the business of rope making, what are called rope tails are used for the purpose of holding back the "top," so that the proper quantity of turn may be given to the lay. In the instrument before us, the strands to be laid are pressed upon by iron bolts, which move in suitable slides upon a flat disk, so that their ends are directed towards the centre of the disk, through which the strands are to pass. The bolts have grooves, or hollows, on their ends, to embrace the strands with sufficient force, which force is regulated by screws, fixed upon bow springs, and bearing against the outer ends of the bolts.

The patentee observes, that "various modifications may be made in the different parts of the machine, or instrument; but declares the character of this invention to be comprised in the construction and use of rubbers formed of some solid body, by which they are capable of preserving their own figure, and of constraining the rope over which they pass, to assume the figure defined by them."

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7. For a *Molasses Gate;* Charles Goodyear, city of Philadelphia, February 5.

This differs but little from the molasses gates already in use for drawing that fluid from hogsheads. The gate slides up and down in grooves, and is raised and depressed by a rod; the improvement consists in adding to it a spiral spring, and two friction rollers; the spiral spring is contained in a cap in the centre of the gate, and, by bearing against the latter, keeps it close against the opening through which the molasses is to flow. This cap is not attached to the gate, but to two arms which cross it, and which are connected by pins in such a way that the spring may, by its reaction, produce the intended effect; upon each end of this arm is a small friction roller bearing against the front edge of the groove in which the plate slides, in order to take off the friction. The only things claimed are, the spiral spring, and the friction rollers. The former will, we think, answer a very good purpose; the latter will probably be laid aside as unnecessary; they render the apparatus more complex, whilst in an article such as this, lubricated by molasses, and yielding to the action of a spring, the friction will be but small.

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8. For *Branch Pipes for Fire Engines;* James Riley, Boston, Massachusetts, February 6.

Branch pipes, the patentee states, are usually made of copper, or

other metal, and covered over with leather or cord. Instead of using a metallic tube, he employs one made principally of leather, but enclosing a wire wound spirally. He takes a rod of wood of the proper taper and size for the inside of the pipe, and to the larger end of it adapts a screw, which is to fit the engine, and to the small end one to receive the nozle. He then sews leather round the rod, embracing in it the shanks of the two pipes. A tinned wire is then wound spirally upon this leather, from end to end; the wire may be about number nine or ten, and the coils about three-eighths of an inch apart. The wires are to be united to the leather by back-stitches, and the spaces between the turns filled with a composition of India rubber, spirits of turpentine, linseed oil, and lamp black. When this has been done, another covering of leather is to be put on and firmly sewed.

The advantages to be derived from a branch pipe thus formed result from its flexibility, in consequence of which the water can be sent in directions which it could not receive from a straight pipe. When a hole has been cut through a roof, or when a fireman is standing upon a ladder, it is often impossible to direct the straight pipe effectually into the opening, or window. "How difficult the task," says the patentee, "to attend to the fire, his footing, in changing from one side to the other, and his pipe; but these difficulties are completely obviated in this improved pipe; the holder commands every point of the compass, with the simplest ease, and without the necessity of moving his body; 'tis his protection from the raging flame, and though duty should call him to the midst of the furious element, his pipe is his shield," &c. &c.

Notwithstanding this eloquent advocacy of a leather branch pipe, we are of opinion that one of copper, altogether inflexible, is to be preferred. We know something of branch pipes, by experience, and therefore speak with some confidence. Their flexibility would generally be a real disadvantage, in an attempt to direct the water to a particular point; and when they were wanted to be used in a curved form, the force of the water in passing through them, would tend to straighten them; for a purpose such as the patentee has indicated, we should prefer to have a curved nozle to screw on, which the engineer might carry in his pocket.

The claim is to "the construction and use of the peculiar kind of pipes, and the several parts thereof, in combination, for the purposes aforesaid."

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9. For *Tanning Hides and Skins;* George Burr, Watertown, Jefferson county, New York, February 6.

The hides, or skins, are to be submitted to the action of beating, or pounding, in, or by means of, any kind of apparatus which will answer that purpose, they being at the same time immersed in the ooze, or tanning liquor. The best means of effecting this, is said to be the employment of the common fulling mill; the hides being put into the trough and acted upon as is usually done with cloth; the ooze, or tan-

ning liquor being put in with them, and renewed as it becomes exhausted. By this action, the hides, or skins, will, it is said, rapidly absorb the liquid, and become perfectly tanned in a few hours.

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10. For an *Evaporating Furnace for Salt Works;* James Colquhoun, Charleston, Kenhawha county, Virginia, February 6. (See account of this patent among specifications.)

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11. For a *Washing Machine;* Uriah L. Clark, Manor Township, Lancaster county, Pennsylvania, February 6.

A hollow cylinder, which is to contain the clothes to be washed, is to revolve within a trough. It is to be perforated to admit the suds from the trough, and furnished with pins and slats on the inside, to raise the clothes, and dash the suds about; the claim made is to "the above described machine, and the arrangement of its several parts."

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12. For a *Machine for Cutting Sausage Meat*; Valentine Glass, Funk's Town, Washington county, Maryland, February 6.

The meat is to be placed in a circular trough, which is made to revolve horizontally within a suitable frame. A bevelled cog wheel, turned by a crank, gears into a similar wheel which lies horizontally on a cylindrical bed, that forms the centre of the trough. Circular knives, placed upon horizontal shafts, revolve within the trough, their edges bearing against the bottom; the shafts are driven by small wheels which gear into the horizontal wheel before mentioned. There are scrapers fixed for cleaning the knives, and the sides of the trough, as they revolve, and contrivances for throwing the meat under the knives. The whole apparatus is described and figured; no part, however, is claimed, either in its individual character, or general arrangement.

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13. For a *Machine for Dressing Feathers;* George Reynolds, East Hartford, Hartford county, Connecticut, February 7.

This machine has, exteriorly, very much the appearance of a large cylindrical coffee roaster. A cylinder of sheet iron, which may be three feet long, and eighteen inches in diameter, has a shaft through its centre, which revolves freely within it, and from which projects a number of pins that may be formed of wire, and of such length as nearly to touch the cylinder. The shaft is of wood, but iron gudgeons from its ends pass through the heads of the cylinder, and one of them receives a crank by which it is turned, the shaft lying horizontally. A door, extending the whole length of the cylinder, opens on one side of it, to admit and discharge the feathers. This machine is to be placed where a fire, the heat of which can be properly regulated, may be placed under it. The feathers to be dressed are first washed quite clean, and suffered to become half dry; they are then placed in the machine, and exposed to the action of a moderate heat, whilst the machine is made to revolve; in this situation they are to be allow-

ed to become perfectly dry, which will be known by the ceasing of the issue of steam through small openings left in the heads for that purpose. It is said that however dead and matted the feathers may have been, they will, by this process, be rendered quite lively; and, whether old or new, they will be equally light, and deprived of every bad smell.

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14. For an improvement in the *Machine for Blowing Glass;* Thomas Bakewell and John P. Bakewell, Pittsburgh, Allegheny county, Pennsylvania, February 8.

On the 14th of December, 1832, Joshua Laird obtained a patent for a machine for blowing glass, and the present patent is for an improvement thereon, which improvement is said to consist in the application of the air condensing apparatus of his machine, and its flexible tube, in connexion with a common glass blower's pipe, upon which a portion of melted glass has been partly fashioned, previously to the introduction of it within the mould or die in which the required article is to be formed.

The insertion of the claim will give a sufficiently clear idea of the improvement. "What we claim as our invention and improvement on the '*machine for blowing glass, patented by Joshua Laird, on the 14th day of December*, 1832,' is, the application of air compressed in a cylinder, or by a pair of bellows, as described by him in the specification attached to said patent, conveyed through a flexible or jointed tube, or pipe, to the end of a common glass blower's pipe, upon the other end of which a portion of melted glass has been previously collected, and the article partly fashioned, which piece of soft glass, when placed in a suitable mould, is by the air so compressed, forced into the cavities of the mould, whilst it is in connexion with the said common glass blower's pipe."

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15. For a *Radiator, or Globe Stove;* Walter Hunt, city of New York, February 8.

The appearance of this stove is peculiar, the body of it being a hollow globe, supported by a column, and having two columns, one on each side of it, which support an arch passing over the body of the stove. The fuel is to be put in at top, an urn that surmounts a cylindrical opening, which stands in the place of the key stone of the arch, being removed for that purpose. The grate is placed at the bottom of the globe, and consists of bars which are convex upward, and is supported by a centre shaft that descends through the column under the globe; this shaft has on it a rack, which, by means of a pinion, may cause the grate to vibrate up and down for the discharge of ashes, which fall through the column into the ash pit below.

"The improvements claimed are as follows. First, the style, general arrangement, and fashion of the above described Radiator, *or Globe Stove;* believing the peculiar advantages of said arrangement in the generating and equal diffusion of heat, exclusively confined to the globe, or spheroid, form, as a reservoir of fuel, for the following rea-

sons, viz. it is the only form from which heat can be equally radiated, and consequently it has the peculiar advantage of imparting one-half of its heat downwards, warming the floor and lower region of atmosphere, which cannot be effected by the angular or cylindrical stove.

"Secondly, I claim the spheroid or hollow globe, or inverted hollow cone, for the bottom section in particular, as a reservoir of fuel, and radiation of heat, in combination with the vibrating and hoisting grate, as above specified, together with the said central hollow column, which prevents the escape of ashes into the room in its descent from the globe to the ash pan.

"Thirdly and lastly, I claim as my improvements separately, and as a part, the rack and pinion, or vibrating and hoisting grate, as before specified."

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16. For *Cast Iron Sleigh Shoes;* Lot Brees, and Ezra Brees, Luzerne county, Pennsylvania, February 10.

The patentees denominate their contrivance "the double grooved and mitred lock sleigh shoes." The shoes are to be made in three nearly equal lengths, and they are to be fitted together by mitred joints, and tongues, and sockets, cast on their ends; on the upper side, which lies against the runner, there is to be a rib, or fillet, which is to pass into a groove. These pieces are to be bolted on, the bolt holes being strengthened round where they would otherwise cut off the fillet. The claim made is to "the double lock, in every form, together with the grooving upon the ends and top of the shoe."

Cast iron shoes have been before made in pieces, and we perceive no difficulty whatever in fixing them on to the runners, so as to form good joints without interfering with the special provisions made by the patentees.

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17. For *Cast Iron Sleigh Runners, and Cast Iron Knees;* Nathaniel Benedict, jr., and Abel Benedict, Salisbury, Litchfield county, Connecticut, February 11.

The claim in this case is to "the making the entire runners and knees of sleighs of *cast iron*, instead of wrought iron, or any other material." There is nothing peculiar in the form of the runners, or knees, or in the mode by which they are attached to the body of the sleigh. We have frequently observed that we do not believe the mere change of material is a subject for a patent, and it is acknowledged in the specification before us that such runners and knees have been made of wrought iron.

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18. For *Locks and Bolts without Springs;* Henry C. Howells, Putnam, Muskingum county, Ohio, February 10.

Although this patent is taken for a very important article, the door lock, the specification of the invention does not contain more than four score words. We are merely informed in it, that the bolt is to be projected by a lever, or weight, by means of joints and cogs, or

without either; that there is a moveable weight inside of the lock, which operates instead of a spring, and that in other respects it is like other locks. Thus ends the specification, without any claim. The drawing, however, has ample references to the various parts of the lock, making its construction completely known; and we are sorry to say that there is not any thing in it which we are able to praise, although we believe it to be, in many respects, new. The object of a lock is security, and when patents are obtained for improvements in them, it is usually proposed to attain this end in a more perfect manner than had been previously done; we, however, have rarely seen a lock which we would more willingly undertake to pick than that before us. It is without springs, it is true, but *qui bono?* is a proper question upon such an occasion, and one which we could not answer satisfactorily.

The bolt is to be turned by a handle, like that to the spring bolt of an ordinary lock, but there is to be a small wheel with cogs upon the shank, which take into corresponding cogs upon the bolt. Another bolt is to be acted upon by the key, and this, when shot forward, fixes the first bolt in its place, so that it cannot be turned by the handle. Instead of the spring tumbler that falls into the notches on the upper part of the bolt, there is a weighted, sliding tumbler, which, most certainly, is no improvement; as, among other objections, it will very soon, from the thickening of the oil, and the insinuation of dust, refuse to fall by its own gravity.

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19. For a *Worm for Stills;* John G. Webb, Waterford, Saratoga county, New York, February 11.

The still worm, which is the subject of this patent, might very well be called a tape worm, as, instead of being round as is usually the case, it is to be flattened, and in this consists its only difference from those in general use. The patentee has set forth certain advantages which are to be produced by his worm, which completely transcends our philosophy; it does not follow, however, that this will be the case with that of others, and we will briefly, therefore, present the reader with some of his statements. He says that "when the liquor, of whatever kind it may be, begins to evaporate and rise, the lighter particles continue their course at the upper part of the worm, while the aqueous substance, being much heavier, will descend, and recede back into the still, boiler, or kettle." It is further said, that "if a quantity of steam and vapour containing spirit and water, be admitted into a cylindrical worm, the moment it enters the worm, *the whole vapour becomes twisted and rolled together*, consequently the light and heavy vapour becomes mixed, and their specific gravity being heavier than the vapour ascending behind, it returns back into the still. But the flat worm gives the vapour an opportunity to ride off, in the same manner that light and heavy substances float in the atmosphere."

Now, certainly, however puzzled the light and heavy vapours may be by their being twisted and rolled together in a cylindriacl worm, they cannot be more so than we are in attempting to accompany them, with the patentee, through their evolutions and contortions, and, as

we do not entertain the slightest hope of being able to unravel the mystery, we think it most prudent to "give it up."

20. For an improved mode of constructing the *Cylinder of a Thrashing Machine;* William H. Weed, city of New York, February 11.

The whole cylinder is to be constructed of wrought iron; for this purpose, three circular pieces are cut out of sheet iron, of about one-fourth of an inch in thickness, and of the diameter of the intended cylinder. Two of these form the heads, and the third is intermediate between them; the whole three are to be placed on a square bar of iron, the ends of which are rounded, and constitute the gudgeons on which the cylinder turns. The beaters consist of bars of iron usually of a square form, their ends passing through, and being rivetted into the heads close to their peripheries: they pass also, through the middle plate, extending to its outer edge. It is recommended to place them in an oblique position, but the claim is not founded upon this or any other particular construction, but upon the making "the cylinder of a thrashing machine entirely of wrought iron, in the manner described; and that independently of the number or position of the beaters, or of the manner of constructing the concave and the other parts of the machine.

21. For a *Churn*, to be made of tin; Thomas E. Warner, Dublin, Hartford county, Maryland, February 11.

The only difference between this and the barrel churn in common use, is, that it is made of tin plate. A cylindrical barrel is placed upon a suitable stand, and dashers are made to revolve within it, in the ordinary way. The patentee would have been at some loss in making out a description of any respectable length, had he not furnished us with the dimensions of the particular parts in inches, and parts of inches; he has not made any claim, not even to the tin.

22. For an *Apparatus for Heating Water*; Isaac Thorn, Bordentown, Burlington county, New Jersey, February 11.

This apparatus is to be applied to the heating of water for the scalding of hogs, and the washing of clothes. It consists of a wooden trough or cistern, the bottom of which is constituted of a metallic cylindrical furnace, and a smoke flue, which run the whole length of the boiler. When used for scalding hogs, there is to be a wooden frame, with slots, upon which they are to be sustained, and protected from contact with the metallic bottom, rollers, and other contrivances to facilitate the moving of the carcases, when under the operation of scalding. The claim is to "the combination and arrangement of the several parts described." There is no novelty in the most important part of this contrivance, namely, in the forming a trough, with sides of wood, and a metallic bottom, for heating water; if, however, the patentee succeeds in uniting the two together so as not to be sub-

ject to leakage, he will be more successful than those persons have usually been who have made similar attempts.

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23. For an improvement in the mode of *Propelling Saws in Saw Mills*; Stephen R. Morrison, Kinzua, Warren county, Pennsylvania, February 11.

The patentee thinks that his mode of moving a saw frame is so superior to that generally followed, by means of a crank and pitman, that it will be well to remove these contrivances, and the water wheel also, from mills already constructed, and to substitute his patent contrivance. We have the misfortune, one of a kind to which we are very liable, to differ entirely from him on this point, as we think his mode of communicating motion one of the most objectionable, whilst, at the same time, it has not the merit of novelty.

A vertical shaft is to be driven by means of a reaction wheel; on the upper end of the shaft there is to be a drum, or cylinder, around the periphery of which is a thread or fillet, of cast iron, passing up and down in a scolloped form. On the lower timber of the saw frame there is to be a piece of iron or steel, with a groove in the head of it, to receive the fillets of cast iron; this piece is to swivel in a socket that the groove may adapt itself to the varying inclinations of the fillet. The drum, when turned by the reaction wheel, will, from its construction, give a reciprocating motion to the saw frame, but with a degree of friction much surpassing that of the crank and pitman. We are assured, however, that a mill of this construction, with only two feet head of water, will be equal to others with a six feet head. The patentee does not directly claim the principle upon which the vibrating motion is communicated, but in this point he shall speak for himself.

"I claim as my particular invention, the manner of attaching the horizontal wheel to the bottom of the saw gate, by means of the cast iron segment constituting the thread upon the segment with an angle; —and the grooved swivel, or tumbler, of cast iron, placed through the bottom of the saw gate, which turns to accommodate itself to the thread of the segment, by means of a gudgeon—thereby dispensing with a crank and pitman in saw mills upon the reaction water wheel principle; with all cog wheels, pitmen, cranks, bearer, tail, head blocks, and binders;—and the same can be used in saw mills that are carried by steam, as well as water power."

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24. For an improvement in *Spring Riding Saddles;* Richard Harrison, an alien who has resided two years in the United States; city of New York, February 11.

The improvement here patented consists in the substitution of whalebone springs or bars, for steel or other springs which have been used in that part of the saddle tree, denominated the bars.

The proposed mode of employing the whalebone, is to cut out the bars of the common saddle tree, leaving only the head and cantle, and such portions of the bars near the cantle, as may be necessary to

give to the saddle its usual shape when finished, and then to place bars of whalebone instead of steel, or others, securing it in the situation occupied by that part of the tree which has been removed. The pieces of whalebone should be about sixteen inches long, two in width, and half an inch thick; and after fixing them, the saddle is to be finished by stretching webbing in a proper manner, as is done in other spring saddles, and applying the ordinary stuffing and covering.

The claim made is to "the substitution of whalebone bars or springs, in the tree, or frame, of the saddle, in the place of wood, steel, or any other material heretofore used in riding saddles."

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25. For *New American Silver*; John H. Haggenmacker, an alien who has resided two years in the United States; city of Philadelphia, February 11.

This patent is taken for a new composition of matters, which is intended as a substitute for silver in the manufacture of various articles. The following are the ingredients employed, and the proportion in which they are to be used:—

Copper . . .	3 lbs.	0 oz.
Silver . . .		1
Zinc	1	4
Cobalt . . .		½
Nickel . . .		12
Manganese . . .		2
Tin		1
Iron		½

These materials are to be completely fused, when, it is said, 5 lbs. 5 oz. of the compound will be obtained; in this there must be some error, as the foregoing ingredients will not combine together without loss, more especially as one of the articles, the manganese, is added, we presume, in the form of an oxide, for it is not probable that the patentee has ever seen two ounces of it in the metallic state.

The German silver, now extensively manufactured, and a beautiful substitute for the precious metal, is a compound of copper, zinc, and nickel. This is now for sale, in sheets, in this country. The French also manufacture a metallic compound, which they denominate Maillechort, that has a similar character, and according to its analysis consists of the same materials, with a trace of iron and of arsenic. The patentee, if he can sustain his patent, is confined to the proportions which he has indicated, and judging from the recipe and from the appearance of the manufactured articles that we have examined, his composition does not possess any advantage over the combinations previously made.

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26. For the *Application of Steam and an Endless Screw in Propelling Machinery;* John Ingham, and Julius Davis, Fabius, Onondaga county, New York, February 12.

The patentees allude to a globe, or cylinder, steam apparatus of their invention, and described in the Mechanic's Magazine; we, how-

ever, need not refer to this, but shall describe the instrument as patented. A hollow shaft is to revolve on gudgeons, and a part of this shaft is to be enlarged so as to form a globe, or cylinder. From this globular part, arms are to project at right angles to the axis of the shaft, which arms are to have orifices at their sides, near to their extremities, from which steam, admitted into the shaft, is to issue, and, by its reaction, to cause the shaft to revolve. There may be four such arms, in two of which the orifices may be so made as to operate in a different direction from the other two, there being a suitable division in the globe, or cylinder, to govern the steam in its course to either pair of arms. Steam may be admitted into either end of the shaft from an ordinary boiler, and, to increase the elasticity of this steam, it is proposed to admit a portion of the waste heat from the furnace into a case, or box, surrounding the globular body. Fire, if required, may also be made within this box, with the same view; this constitutes the steam part of the machinery.

In order to use the power thus generated, there is to be an endless screw upon the shaft, which is to gear into a toothed wheel, from the shaft of which the desired communication may be made. This engine, we are told, may be used for propelling boats, for driving mills, for moving carriages upon rail-roads, raising vessels on marine rail-ways, &c. &c. The claims are to the use and application of an endless screw in the manner, and for the purposes mentioned; the manner of using the globe, or cylinder, and exposing it to the escape heat of the boiler; and a valve, or damper, by which the escape heat is directed upon, or diverted from, the globe; the method of changing the direction of the motion; and "the producing of a given degree of power by the use of steam with less expense of fuel or machinery, and with less danger of explosion, than in any of the methods heretofore practised or known."

Although this engine *may* be used for the various purposes designated, such an employment of it will not be the result of an intimate acquaintance with steam power, or that of mechanical arrangement. A less efficient way of using the former has rarely been proposed; and why this power should operate through the intervention of an endless screw, it would not be easy to tell, unless there is some hidden mystery in its action, with which we are unacquainted. A pinion, or spur wheel, upon the shaft, would prevent all that lateral thrust from the screw, to counteract the effect of which the patentees throw away a corresponding portion of their steam power, by making the orifices on the arms oblique, that the steam may issue in a direction which will counteract the thrust.

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27. For a *Machine for Hulling Cotton Seed;* Lyman D. Coverly, Weathersford, New London county, Connecticut, February 12.

A stone, like an ordinary mill stone, of about three feet in diameter, is to be fixed upon a shaft, or spindle, so that it will revolve horizontally, its face being picked perfectly true and fine. A flat stone is

placed above this, so as to cover more than half its face; and the seed to be hulled is put into a hopper over the uncovered portion of the revolving stone, and carried under the above named flat stone, the distance between the two being graduated by a bridge tree. To cause the seed to be fed on to the revolving stone, a revolving cylinder, having pins in it, is placed within the hopper, and acted on by a whirl and band.

Messrs. Follet and Smith, of Petersburg, Virginia, have patents for machines for hulling cotton seed, in which they accomplish the object by rubbing the seed between two stones, one of them a revolving cylinder, the other a concave segment; we have not at hand a copy of the specification of one of their improvements, but we are mistaken if it does not contain a mode of feeding from the hopper similar to that above described.

28, For a *Water Wheel*; William Shepard, Gibson, Clearfield county, Pennsylvania, February 12.

There are some things which improve, and some which deteriorate, by age, whilst others remain unchanged during their whole career; and although mechanical contrivances do not belong to the latter class, the principles upon which they are dependent are coeval and coexistent with time and nature. Against these principles the contrivance before us has heretofore been found to sin, and the offence being against laws like those of the Medes and Persians, its former sentence of *non compos*, remains unchanged. Had the patentee looked upon the shelves of the patent office, or had he been advised of what is to be seen there, he certainly would no longer have accounted his invention *new*, although it might have been necessary for him to expend some time and money upon it in order to convince himself that it is not *useful*. The contrivance is a shaft running upon gudgeons, with any convenient number of paddles, or floats " at a proper angle with the shaft and current, the paddles being of the best shape to act on the water." The shaft, with its paddles, is to be placed in a trough through which the water runs, or in a current, or, when for propelling, under the keel of a boat. The claim is to " the peculiar con-construction of the water wheel, as before described." Although there are several other persons who had previously claimed the same thing, we would for a very small premium guarantee this last claimant against the result of all suits for an infringement of vested rights.

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29. For a *Thrashing Machine;* William Morgridge, Chesterville, Kennebeck county, Maine, February 12.

A cylinder, twenty inches in diameter, and two feet long, covered with punched sheet iron, is to revolve in a suitable frame; five smaller cylinders, two and a half inches in diameter, are placed above this, in the manner of those in a carding machine; four of these are covered in the same manner, the other is left smooth. The cylinders are capable of adjustment as to distance, and are to be turned by bands and whirls. When used for the seeds of grasses, a concave

segment of punched sheet iron covers the main cylinder for eleven inches of its width; the feeding is effected in the usual way. The claim made is to the whole machine, with the exception of "the crank, bands, posts, cloth aprons and whirls."

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30. For an *Improvement in Naval Architecture;* Christopher Hoxie, city of New York, February 13.

The principle of construction here intended to be patented, consists in the employment of two long, parallel, hollow tubes, made air tight and water tight, connected together, and propelled by sails, steam, or otherwise. The experimental boat to test its efficacy, had two hollow, air tight, tubes, made square, and pointed at the ends; they were about thirty feet long, and ten inches in diameter. A deck was mounted on a suitable frame, and both paddle wheels and sails tried upon it. The tube, it is said, may be of any form, and may be divided internally into several compartments, so that any accidental injury shall not affect it in its whole length.

The points claimed are not stated, and although this patent has been obtained somewhat earlier than that of Mr. Burden, of Troy, for a structure somewhat similar, we are very apprehensive that in this case "the first shall be last and the last first."

From the models which we have seen arriving at the patent office we are apprehensive that young as is Mr. Burden's boat, it has already a numerous progeny, some of whom have taken the precaution to smut their faces, that their relationship may not be at once apparent; perhaps, however, when they are washed, and appear in their true colour, their affinity may become manifest.

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31. For a *Thrashing Machine;* John P. Williams, Eldbridge, Buckingham county, Virginia, February 13.

This thrashing machine has the same general form with those of the cylinder kind, so frequently described. There are teeth upon the cylinder, surrounding it spirally, which are arranged somewhat differently from most others, but not so as to vary their effect, the main difference being in the teeth of the concave segment; these are placed in rows, on separate bars, which turn upon gudgeons, so that when subjected to any unusual force, they will bend down before it, one of the gudgeons of each bar being operated upon by a spring, or some similar contrivance, by which the bar is restored to its proper position.

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32. For an improvement in the *Printing Press;* Daniel Neall, city of Philadelphia. First patented November 15, 1825. Patent surrendered and reissued under an amended specification, February 13.

We shall not give any description of this press, as it is to be found, with a plate, in the American edition of Nicholson's Operative Mechanic. In the original specification there was not any claim made, and the omission is now supplied in the following form:

"The peculiar advantage of this press is, that the power by which the inking process, and the removal of the printed sheet, are effected, is obtained from the necessary movement of the bed; and of this improvement, whether effected precisely in the manner specified, or in any other operating upon the same principle, and producing a similar effect, I claim to be the inventor."

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33. For a *Press;* Jesse Cramton, city of New York, February 18.

The description of this press is meagre and defective in the extreme, and although it is accompanied by a good drawing, this is without written references to its respective parts. The power is to be communicated by the turning of a shaft, which is situated at the upper end, close to the cap piece. This shaft has on it either two or four eccentrics, to operate upon a double rack, or racks, which rise from the follower. When there is but one double rack, it rises vertically from the centre of the follower, the cams, in this case, being on the centre of the shaft. Two sliding boxes, one on each side of the rack, are alternately raised and depressed by the cams, and these sliding boxes have teeth on them which, as they descend, catch upon the teeth of the racks. When there are four cams, there are two such double racks, one placed near each cheek of the press. The parts claimed "are those which cause the continued pressure, which is the application of the racks and sliding blocks to the cam press.

We do not perceive any advantages offered in this press above those in others now in use, and although the double rack may not have been applied in precisely the same way, the principle has been known and used for more than a century; and, according to the form of the claim, it would appear that the patentee does not confine himself to his peculiar arrangement.

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34. For *Wire Covering for Window Frames;* James Sellers, city of Philadelphia; February 18.

This patent is taken for the employment of the ordinary wove wire, with square meshes, in the covering of frames for cellar windows, in such a way as to make it resemble in appearance that kind of wire work, with diamond formed meshes, which is made by hand. The wire is to be woven in the usual way, cut into the proper form, and the square stretched diagonally, so as to produce the intended effect.

"What I claim as my invention," says the patentee, "and for which I ask a patent, is the affixing to frames for cellar windows, and for other purposes, of wire wove with square meshes, when extended so as to form rhombs, or diamond formed openings, which shall stand with their opposite angles in the same vertical and horizontal lines; thereby giving to them an appearance similar to those frames which are covered with wire work prepared by hand, and having the meshes in the form described."

35. For a mode of *Preparing Hard Tallow, or Stearine;* Carl G. Ritner, Cincinnati, Hamilton county, Ohio, February 18.

Fifty pounds of tallow, two of sulphuric or of nitric acid, and twenty-five of rain water, are to be boiled together, and kept constantly stirred for an hour. They are then to be poured into a strong wooden tub, with a close cover, and to remain at rest, gradually cooling for twenty-four hours, in which time the oily and solid parts will separate, the latter being granular. The whole is then to be placed in a suitable case, or tub, to be pressed, the bottom and sides of said tub being perforated, and a cloth sufficiently large to surround and cover the materials being first laid within it; willow hurdles are also to be placed between every layer of three inches. On making pressure, the oil will run out to the amount of twenty-five per cent. of the mass. "The hard tallow, which I now call *strahein* [qu.] is taken from the cask, and put back into the kettle, with twenty pounds of soft water, four ounces cream tartar, and four ounces allum, which must be boiled and skimmed until clear. As this tallow is brittle, in order to give it the requisite elasticity, add one-eighth pound of bees-wax, to each pound of tallow."

Another method proposed is the following:—A clear ley is to be made from four pounds of pearl ash, and four of quick lime; this is to be put into a copper kettle, boiled, and stirred, for three hours "until it becomes a mush, by taking a little of which in a tumbler of cold water, it will dissolve like soap; this, when cold, is cleaned like first process, and pressed."

The foregoing is the conclusion of the specification, and it will be seen, therefore, that the patentee has not informed us how much of the foregoing processes he claims as new, nor does he appear to possess any correct knowledge of the nature of the operation which he describes; this latter circumstance, however, would be one of little importance as regards the validity of his patent, were his processes new and useful. The soap maker rarely understands the nature of the chemical changes which take place from the action of the alkalies on the fatty matter which he employs; but if he mixes his ingredients, and treats them correctly, his soap will be just as good as that made by a more scientific manipulator. The two processes are supposed by the patentee to produce analogous results, but in this point he is in error, nor will he by either of them obtain pure stearine, or the hard matter of fat; but this is not all, nor the point of highest importance; the materials which he will obtain will not make good candles, such as will give a clear light, and burn with a clean wick. It is foreign to our present object to enter into a scientific disquisition upon this point, the subject is one of much intricacy even to the well read chemist, and our business here is with practical results. We have before had occasion to notice the difficulty of getting rid of the alkali employed in decomposing fatty matters, as may be seen on turning to our notice of the patent of Mr. Lapham at p. 167 of vol. xii.; and in the latter of the above named processes no attempt is made to do so.

36. For a *Thrashing Machine;* Jehial F. Axtell, Geneva, Ontario county, New York, February 18.

It is unnecessary to describe this machine, as the thing claimed does not confine the invention, or discovery, to machines of any particular construction, but extends to all, past, present, and to come. "The improvement claimed is in making the sides of the machine of iron, instead of wood and other materials, and for the manner in which the same is put together," the said improvement being called "*Axtell's Cast Iron Thrashing Machine.*"

If we read the patent law, and the decisions under it aright, such a patent is of no value; there is neither invention or discovery in the thing; every body knows that the sides of such a machine might be made of cast iron, and that it might be put together by means of flanches and screw bolts. If this patent is good, so would another be for a machine in all respects similar, but cast of zinc, or any other metal, or metallic compound, than iron.—It is a mere change of material.

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37. For *Improvements in Milling;* Robert C. Stephen, Hackettstown, Warren county, New Jersey, February 18.

These improvements are said to consist in a mode of fixing mill stones, so as to admit cool air to the flour; and of creating a current of air to give the flour greater velocity in descending the spout.

In the first place, it is said that the stones must be dressed to suit the revolutions per minute, and that for one hundred and twenty revolutions, they must have six inches draft, in a four feet stone. The stones are to be divided into twenty equal divisions, having two long furrows to each division; in every other division, the furrow is to be an inch and a half wide, and three-quarters of an inch deep, terminating at the eye; inclined in depth and width from the circumference towards the centre, with fine feather edges. An opening, or eye, of ten inches, is left in the centre, to admit air and grain. In the upper stone there is a concavity, fifteen inches around the centre, and in the lower a convexity. The hoop enclosing the lower stone has a pipe placed in it, in the direction of the spout; this is closed on one side by a valve, and open next that of the spout, to produce a current of air to drive the flour down the spout with increased velocity.

The invention is said to consist "in the before described mode of drafting the stones, so as to cool the flour without the use of a hopper boy; and in the mode of introducing a current of air and forcing the flour down the spout, preventing its stopping, or clogging."

Should the foregoing account of this invention appear meagre, the fault is not ours, as we have given every thing which the specification contains. The drawings throw no light upon the subject, nothing more being shown in them than the faces of the stones, imperfectly represented; the spout, valve, and manner of creating a current of air, are all left to be guessed at.

38. For *Constructing and using Caissons for the Founding of Piers, &c.*; George Daniels, city of Philadelphia, February 28.

A scow is to be prepared sufficiently large to have, through its deck and bottom, an opening large enough to allow the caisson, when constructed, to pass through it. The scow is to be moored by means of guide anchors so as to allow it to rise and fall with the tide. In the drawing which accompanies the specification, the cover, or caisson, is represented of an oval form, and made of boiler iron, but we are told that it may be made in part of wood, and in part of metal. Piles are to be driven down through the openings in the scow, "and over them is to be let down, by proper tackle, the outside cover, or proprotector of the caisson," before spoken of. When the bed of the river is of mud, or stiff clay, to a considerable depth, the patentee presumes that no particular precaution will be necessary to prevent leakage; but when this is not the case, an apron of leather, or tarpaulin, is to be attached round the bottom of the caisson, so as to lie on the bottom where it is to be covered with stones and gravel. This apron, it is said, will render it unnecessary to sink the cover entirely to the bottom.

To raise the caisson, and the piles, when no longer required, the scrow is to be attached to them at low water mark, and the rising of the tide is to lift them by hydrostatic pressure.

The claim is to "the employment of a movable cover, to systems of pile or frame work, for the purposes before mentioned; and the dividing of the scow into parts for removing it clear of the work."

The patentee has not clearly explained what he intends by his caisson, protected by a cover; enough is given, however, to convince us that he will find it difficult, in most cases, to raise his piles and cover by the means indicated, and, more especially, to lift the latter over the piers, excepting in very small works. A tarpaulin, or leather apron, we do not think will prove very effective, when employed for the purpose, and in the manner, indicated.

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39. For improvements in the *Covering of Roofs with Tin or other metal;* John Hanson, Lexington, Rockbridge county, Virginia, February 28.

In a former number we described the mode of covering roofs with tin, invented by Prof. Charles Bonnycastle, of the University of Virginia; the present plan proposes certain improvements upon the former, and contains, also, a description of the tools employed in performing the work; the *models* are referred to for illustration, but no attempt is made to distinguish the points of improvement, or to tell to what extent the tools and other things described, are considered as new; this is to be regretted, as we believe the plan to be a good one, and understand that it has been fairly tested.

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40. For an improvement in the *Art of Boat Building;* George W. Eddy, Waterford, Saratoga county, New York, February 28.

The improvement consists in what the patentee calls *safety hulls.*

In a steam-boat he proposes to build the main hull three hundred feet in length, and about eighteen or twenty inches in width. On each side of this main hull is to be a *safety hull*, which may be of the same width with it; they are to curve round the bow so as to be of a good form, for passing through the water, and the same at the stern. Spaces within them are to be left for the paddle wheels, on each side of the main hull, or the wheels may be applied on the outside of the said safety hulls.

"Said hulls, or trunks, may be made cylindrical, or partake of the section of a cylinder, or of any other shape." "Now what I claim as my invention, and for which I ask a patent, is the principle above described." This is not a very clear manner of claiming a new mode of constructing boats, and time will show to whom belongs what, we suppose, is intended by "the principle."

41. For a *Machine for Cutting Paper;* John Ames, Springfield, Massachusetts, February 28.

This apparatus is intended to cut machine paper into sheets of any required length, as it comes from the drying cylinders. The paper descends by its own gravity, and in doing so passes the edge of a standing knife, which extends across the frame for the purpose of aiding in the cutting. Below the standing knife a shaft crosses the frame, carrying two disks, or arms, to which another knife, called the revolving knife, is attached. This, as it passes round, comes into contact with the standing knife, and between these the paper is divided, as by a pair of shears, the revolving knife being so placed that it comes in contact with the standing knife at one end, whilst the other is at a distance of about three inches, thus cutting the paper successively along the whole width. As the paper is descending continuously, the sheet would be cut out of square, were not some provision made to prevent it; this is effected by means of a swing frame acted on by a cam, a bar across this frame coming in contact with the paper, and holding it at rest against the fixed knife during the moment of cutting, the cam then relieving it. The size of the sheet is regulated by that of the whirl on the shaft of the revolving knife, which can be changed at pleasure.

The claim is not to "the revolving knife, nor any of the parts of the above described machine separately, but to the several parts in combination, as above described, for the purpose aforesaid."

42. For *Machinery for Cutting or Trimming Paper in the Ream*; John Ames, Springfield, Massachusetts, February 28.

Two upright cheeks are connected together by cross pieces, and between these cheeks is a sliding frame worked in grooves, and having a knife at its lower edge, which extends from cheek to cheek. The paper, in the ream, is to be confined in a suitable press, and its edges successively subjected to the action of the knife.

The patentee says, "I do not claim the knife, or the separate parts of said machine, or said press, as my invention and improvement is,

the combination of machinery in the manner above described, for the purposes aforesaid."

A claim of the above description is very good, where the combination is essentially new; but there is no magic in it, and it will not therefore change the character of, and give an exclusive right to, what is essentially old, which is the case with the machine before us. It has been many years before the public as a patented invention, and has been extensively used.

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43. For *a Bush and Spindle to a Grist Mill;* Jesse Barber, Phelps, Ontario county, New York, February 28.

The improvements here claimed consist in a mode of oiling the spindle and followers, without the trouble of removing the stone; and of tightening or loosening the followers around the spindle, at pleasure, by the mere turning of a screw or screws.

For the purpose of oiling, a tube, or pipe, projecting a short distance above the driver, descends through it, and passes into a hole in the shoulder, or neck of the spindle. A small hole is then bored from the outer side of the spindle, to meet the one into which the tube descends. Oil supplied to the tube is thus distributed around the spindle and followers, and enough may be contained in the tube to last for forty-eight hours.

The followers, which steady the spindle, are in the ordinary form; the wedges which are used to confine them in their places are made of wrought iron; they are lengthened out below, so as to form a screw bolt, and from the outer frame of the bush, of cast iron, a stirrup descends to the bottom of the bed stone, through a foot in which screw bolts, which are attached to the wedges, pass down, and by means of a nut on the lower end of each of these bolts, the wedges may be tightened or loosened at pleasure.

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44. For an improvement in *Water Wheels;* David H. Gilbert, Dorchester, Norfolk county, Massachusetts, February 28.

We have here again the reaction water wheel, which we have so frequently described, and differing but little from some of those previously noticed; and, in most of those cases where there is some apparent variations, the observation is made, that it is not necessary to make the parts spoken of in this form. The gates for closing the apertures of the buckets, although similar in the effect produced, by them, differ in their mode of action from those formerly noticed, but as there is nothing claimed but "the construction and use of such wheels as above described, and such cisterns within them, in connexion and combination with each other," we really do not know what it is intended to patent.

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45. For an improvement in the *Machine for Making Paper;* Joseph Truman, Bridgeport, Fayette county, Pennsylvania, February 28.

The patentee describes the construction of the cylinder machine

for making paper, and then observes, that from the manner in which the pulp is made to adhere to the revolving cylinder, there is a tendency in the fibres to arrange themselves in one direction, so as to give but little strength to the paper, which inconvenience it is the object of his invention to obviate. This he proposes to do by taking pieces of sheet copper, or other suitable material, and forming with them a sort of rack, by uniting them at one end to a cross bar, keeping them by this and other means, at a suitable distance from each other. These strips of metal are made concave at one edge, the curvature being adapted to that of the cylinder. This apparatus is to be placed within the vat, so that the concave edges will be nearly in contact with the cylinder, in consequence of which the pulp which passes to it must flow between these plates. A vibratory motion is given to the cross bar, and consequently to the pieces of metal attached to it; the sum of the distance through which the rack moves laterally, being equal to that of the motion of the cylinder in the same time. This apparatus thus becomes an agitator, and it is said that the paper is, by its means, rendered equally strong in all directions. "The agitating the pulp so as to completely intermix the fibres, equalize its consistence, and consequently strengthen the paper every way alike, I claim as my invention, though the specified means, and manner of doing it, may be varied *ad libitum.*"

A person unacquainted with the progress of invention in the art of paper making, would be led to conclude from the specification of this patent, that the agitator, for interlocking the fibres of the pulp was new in all its forms, whilst, the fact is, that although the evil complained of existed to a very considerable extent in the machine paper first made, it has been so far obviated by the agitators which have been invented, as to leave but little sensible difference in the strength of machine paper in either direction. Possibly the apparatus now patented may be superior to any other, but although specifically and clearly described, it is not claimed; but, instead of this, a broad claim is made to the agitating the pulp, so as to effect the desired object, by whatever means it may be accomplished, a claim which can never stand in law, as it is broader than the discovery, and, if admitted, would forestall all improvement.

SPECIFICATIONS OF AMERICAN PATENTS.

Description of a new Evaporating Furnace, and general process for accelerating the preparation of common salt by artificial heat; for the precipitation, incidentally, of colouring matters, deposited by the waters of the Western Salines; and for a method of consuming the smoke in said furnace; for which a patent was granted to JAMES COLQUHOUN, *Charleston, Kenawha county, Virginia, February* 6, 1834.

In constructing this furnace, parallel walls are to be built at the distance of five feet from each other, and extending twenty, thirty,

forty, or more feet in length. These walls are to be lined with fire brick, as, when enclosed at their ends, they form the body of the furnace. A series of circular arches is to be formed in these walls for the introduction of cylinders of cast iron. leading from the boilers on the outsides of the walls, into the interior of the furnace. The boilers, or evaporating vessels, are to be wooden cisterns, which may be fourteen feet long, seven wide, and five deep. From one side of each of these troughs, near their bottoms, project five hollow cylinders of cast iron, one end of which is open, the other closed; they are properly secured to the cisterns by iron flanches and screw bolts, at their open ends, the side of the cistern being perforated to receive them. The cylinders which have been used, are thirteen inches in diameter, and six and a half feet long; four and a half feet of their length being introduced through the wall into the furnace. There are similar perforations in each wall, as cisterns are to be placed along on each side of the furnace, the cylinders from one cistern passing into the spaces between those of the opposite cistern; or they may be so arranged as to be either above or below them; or so that lines uniting their centres may form a zigzag. The space occupied by the cylinders is to be covered by a flat pan.

These cisterns not being applicable to the process of crystallization, are only employed in evaporating until the liquid becomes nearly a saturated solution, when it is drawn off, at a boiling heat, into pans of sheet iron, or lead, for granulation by steam heat.

The granulating vessels, which, for convenience in manipulation, are five or six times as long as they are wide, are to be supported in a frame work, or trough, of wood, the floor of which is a little inclined, that it may carry off the water formed by condensed vapour; the flat bottoms of the pans are to be supported above this floor, by a sufficient number of plank placed edgewise, and the separate compartments thus formed are to communicate with each other, so that they may, in effect, form one steam space, or chamber. The pan must be so secured to the frame, or trough, by its sides, that steam may not escape between them. The steam from a boiler is to be conducted into the steam chamber through wooden tubes.

Some other modifications in the construction of the granulating apparatus, are contained in the specification, which, for brevity sake, we pass over.

Three cisterns are next spoken of, which are to be so arranged as to enable the manufacturer to make use of the steam not condensed under the granulating vessels, for the concentration of brine, in order that the heat contained in it may not be lost; the use of these cisterns is described, and in connexion with them there is to be a frame of wood twenty or thirty feet high, and strengthened by cross timbers in various parts. False bottoms, perforated with holes, hurdles, or other contrivances, are to be contained within it to distribute the brine which is to be raised and allowed to fall through them; in doing which it is to come into contact with various metallic tubes, heated by steam. As we are not aided in this part by drawings, the arrangement is not made very clear, nor does it appear that it has been fully

tested by the patentee, who says, in reference to the metallic tubes, "that they were first suggested to this applicant by way of experiment. Hence he incorporates them with this manufactural process, and claims the privilege of using them, as a part thereof, in the manner described."

The three cisterns, and their appendages last spoken of, are intended to aid in the precipitation of the colouring matter contained in the saline waters. It is said that there are held in solution, in the waters, sulphure ted hydrogen, carbonate, or supercarbonate of iron, and supercarbonate of lime; the first two of these, on decomposition, deposit colouring matter, to get rid of which, much labour and time are consumed in the ordinary process in the western works. Both the sulphuretted hydrogen, and the supercarbonate of iron, are, it is remarked, effectually decomposed in the process described by the patentee, and the arrangement of the cisterns is such that the precipitation of the colouring matter, goes on alternately in two of them, so that the contents of one are always ready to replenish the evaporating cistern.

The methods of consuming smoke, adopted in ordinary evaporating furnaces would not, it is believed, be applicable to one constructed like that used by the patentee. The mode proposed of effecting it in these furnaces, is the introduction of steam, through tubes, into the fore part of the furnace. The action in this case is hypothetically stated, and the effect appears to be rather a thing of inference, than the result of experience, and is neither distinctly presented or claimed.

The specification is manifestly drawn up by one possessing a due acquaintance with the chemistry of the operation, and is written with much general intelligence; still it is altogether defective as the foundation of a patent. In an instrument of this description there should not be any thing vague, or conjectural; nothing is secured which is not distinctly described, and altogether novel in its application or arrangement; in describing an apparatus, or process, it will, in general, happen that things which are not new, must be introduced to render the other parts intelligible, but when this is done, the applicant must carefully distinguish these things, and parts, from each other. He is to tell the public in what his invention consists, and the law expressly declares, that he shall do that in such full, clear, and exact terms, as to distinguish the same from all other things before known. There is undoubtedly enough of novelty in some parts of the apparatus and process described, upon which to have founded a legitimate claim, but this has not been done by the patentee.

Specification of a patent for an improved mode of manufacturing water proof boots, shoes, socks, &c. Granted to WILLIAM ATKINSON, *Tewkesbury, Middlesex county, Massachusetts, March* 8, 1834.

To all to whom these presents shall come, be it known, that I, William Atkinson, of Tewksbury, in the county of Middlesex, and state of Massachusetts, have invented a new and useful mode of man-

ufacturing water proof boots, shoes, socks, and overshoes, and other articles of similar character, and that the following is a full and exact description thereof.

The foundation of the boot, shoe, or sock, overshoe, is formed of wool, or tow, or a compound of wool and fur made into felt in the same way in which felting is effected in the manufacture of hats. To this material a suitable shape is given by being drawn over a last, or by other means.

I then take a varnish made by dissolving caoutchouc, or India rubber, in naptha, the essential oils, or any of the known solvents of that substance, with which I coat over the foundation of felt or cloth; upon this I lay a covering of cotton, or linen, cloth, or of any kind of cloth suitable to give firmness to the foundation, and to prevent stretching, and upon this I lay coats of the caoutchouc, either in the varnish, or otherwise prepared, and made perfectly black, or of any other colour, or left of the natural colour of the caoutchouc.

For the soles I attach leather, over which the varnish, or the caoutchouc in sheets, may be applied. This method prevents sharp, or other, substances, cutting through the boot, and gives security and firmness to the sole of the foot, perfectly covering the leather, or canvass, which may be used at the side and bottom. The sheets may be applied by softening the surfaces to be attached with the spirits of turpentine, or any of the solvents, so as to make it tacky. Let them get nearly dry before attaching, and much time will be saved and the fabric will more quickly become firm.

The heel may be stiffened by cloth, leather, or other material; and the lifts of the heels formed by attaching leather together by the caoutchouc in the nearly dry state of the varnish; or they may be made of the caoutchouc entirely, and attached as before mentioned and described. When boots are formed, I cause the webbing, or leather, of which the straps are made, to pass down the leg of the boot, and reach nearly to the bottom, in order to obviate the stretching of the material of which the boot is formed.

What I claim as my invention is, the application of woollen felt, of wool and fur, or other cloths, or a combination of wool and fur, to the formation of boots, shoes, socks, or overshoes, and articles of similar character, and the covering the same with caoutchouc or India rubber, in the manner, and for the purposes herein set forth.

William Atkinson.

Specification of a patent for an improvement in the construction of Steam-boats and other vessels. Granted to Henry Burden, *city of Troy, Rensselaer county, New York, March* 8, 1834.

To all whom it may concern, be it known, that I, Henry Burden, of the city of Troy, in the county of Rensselaer, and state of New York, have invented a new and useful improvement in the method of constructing steam-boats, and other vessels, whereby they are ren-

dered capable of being propelled with greater velocity by the application of a given power, than any of those which have heretofore been constructed; and I do hereby declare that the following is a full and exact description of my said invention.

It is an ascertained fact, that in order to lessen the resistance opposed to a solid body in its passage through a fluid, all that is necessary is to decrease it in its transverse section, and to give to it a proportionate elongation, and a proper curvature. It has not, however, been found practicable to carry this to a much greater extent than has already been done, whilst the hulls of vessels are constructed upon the plan of building ordinarily pursued. To take advantage of this principle, and to avoid the difficulties hitherto experienced in the attempt to do so, is the object of my invention, which I carry into effect in the following manner.

I construct two, or any convenient number of barrel-formed floats, of great length in comparison with their diameter; these I prefer to make perfectly round in their cross section, tapering them from the middle towards each end, but leaving them curved longitudinally in the manner of a barrel, and carrying them to a point or nearly so at each end. These floats I form of staves throughout the greater part of their length, or until the interior diameter of the float becomes so small that it will merely admit a man to tighten the staves, the remainder thereof being of solid timber.

When two such floats are used, I place them at such distance apart as to admit of the revolving of the propelling wheel between them; a suitable number of beams pass from one float to the other, to connect them together; which beams are hollowed at each end so as to fit the curvature of the floats, and are fastened to them in a way to be presently described. Upon these beams the superstructure, containing the cabin, machinery, &c. is sustained.

The staves of which the floats are made, must, in thickness, and in other respects, be proportioned to the size of the vessel. When the floats are of such a length that timber cannot be obtained sufficiently long to make the staves in one piece, I use two or more lengths, joining the ends by tongues and grooves, and taking care to break joints so as not sensibly to lessen the strength.

As it is of vast importance that these staves should be forced together so as to be water tight without depending upon caulking, and that they may be drawn together at any time, without encumbering the surface of the float by hoops, or any similar contrivance, which, at the best, would answer the purpose very imperfectly; I make hoops, or rings, either of cast or of wrought iron, the outer diameter of which must be less than that of the interior of the float, in the parts where they are to be placed, and their interior diameters such as that a man can conveniently pass through and tighten the nuts which bear against them. Through each of these rings there are as many holes as there are staves to be drawn together. A bolt passes into them through each stave, its head resting thereon, being made sufficiently large, or having a suitable washer, or plate, under it to prevent its drawing through the timber. The inner end of each

of these bolts is tapped, and furnished with a nut, by means of which the staves may be drawn towards the outward periphery of the hoop with any desired degree of force. There must be such a number of these rings, or hoops, as may be found necessary to render the staves perfectly tight; a point to be experimentally decided: I, however, esteem a distance between them of five feet to be such as will in general answer the purpose perfectly.

The beams, or timbers, which connect the floats, are to be bolted thereon, there being solid blocks within the floats for the bolt heads, or nuts, to bear against; the hollowing of the lower sides of these timbers forming a sort of saddle, by which they fit to and span over the top of each float.

The length and diameter of the floats, the thickness of the timber employed therein, and the particular size and strength of the other parts, will depend upon the dimensions of the general structure, and the load to be carried, and may, in great part, be calculated upon known principles, although they must also, in part, be determined by experience. Without intending to confine myself in these particulars, I will here give the proportions that I have adopted in a boat which I have built upon the foregoing plan.

The floats are three hundred feet in length, and eight feet in diameter at the centre; the number of staves is twenty six, and their thickness three inches and a half.

Although I propose to give to the floats a round form, the principle upon which they are constructed will admit of their being varied in this particular, requiring only that degree of curvature in their section which will admit of their parts being drawn together by an internal apparatus of bolts and screws, so as to form perfectly close joints. As, however, the quantity of timber, in proportion to their capacity, the equal tension of the parts, and other important points, will be best attained by a circular form, I give to this the preference.

The drawings which are deposited in the Patent Office, with the written references thereunto annexed, will serve fully to illustrate the various points to which allusion has herein been made.

What I claim as my invention is, the using of two or any other number of floats, constructed upon the principles herein set forth, made of such size that they shall, from their buoyancy, sustain the superstructure and load, answering in this respect the purposes of the hull of an ordinary vessel, for which they are substituted, but offering a much less resistance in their passage through the water. I also claim the within described mode of drawing the staves, or separate pieces of such floats together, by means of internal hoops and screws operating upon the principle set forth; not intending to confine myself precisely to the mode of forming or putting together the various parts, as given in this specification, but to vary the same in any manner which I may find convenient, and which is in conformity with the general principle of procedure, and which produces analogous results.

Henry Burden.

Specification of a patent for an improved process for manufacturing Tea Pots, and other articles of Brittania Ware. Granted to William W. Crossman, *Taunton, Bristol county, Massachusetts, March* 12, 1834.

To all to whom these presents shall come, be it known, that I, William W. Crossman, of Taunton, in the county of Bristol, and state of Massachusetts, have invented a new and improved process in the manufacturing of tea pots, coffee pots, sugar dishes, cream jugs, and other articles, which are capable of being formed in the lathe, and are made of that kind of metal, alloy, or mixture of metals, of which those vessels are constructed, which are denominated Brittania ware, or any other similar metal, or mixture of metals, capable of being so wrought; and I do hereby declare that the following is a full and exact description of the said process.

The ordinary mode pursued in making such ware is to raise, or stamp up, from the sheet metal, such parts, say one-half, of these vessels, as will relieve from the mould or die after stamping, and then to solder such parts together. By the process which I have adopted, I rub, or burnish up, the required vessels, from a single flat plate, or sheet. Thus, suppose it is intended to form a tea pot, the middle part of which is intended to be bulging, or bellied; I fix in the common turning lathe a chuck, the outer end of which I turn into the form intended to be given to the lower half of the tea pot, leaving the inner end, which is fixed to the mandrel of the lathe, cylindrical. I then take the circular plate of metal and place it centrically against the outer end of the chuck, and against this, a flat piece of wood, against which the front centre of the lathe is to be brought up, so as to keep the metal in its place, and to allow it to revolve with the lathe. When put into rapid motion, I bear against the metallic plate with a soft piece of wood, or other suitable substance, so as to turn it over into the chuck, by which means the lower half is formed. In order to finish its upper part, I fix the lower end in a hollow, or female chuck, and by bearing against the upper end with a soft piece of wood, I give to it such form as I desire, which I can readily do by steadying the piece of wood on the rest. It is not necessary, in this case, that there should be any solid substance within the part of the pot to be so formed. But should this be in any case desired, such a piece may be very readily placed there, passing it in at the open end of the pot, like the end of the T of a rest, and sustaining it in a similar manner, where the metal may be brought up to it by the pressure of the piece of wood on the outside.

I have thus fully described the manipulation in such a way as will enable any competent workman to follow it without difficulty, and to produce any of the forms required in such ware, or vessels, to which the latter is adapted. When it is desired, beads, rims, or edges, may be afterwards added to vessels so formed, so as to meet the require-

ments of taste, or fashion; but in doing this, there is nothing peculiar in the mode of procedure.

What I claim as my invention, and for which I ask a patent, is the forming of the bodies of tea pots, coffee pots and other articles, of Brittania or other metallic ware, or vessels from one piece of any metal capable of being so wrought, without the necessity for soldering seams, by taking flat plates of metal, and giving to them the required shape in the lathe, whether the same be done precisely in the manner herein described, or in any other dependent upon the same principle, and producing a similar effect.

WILLIAM W. CROSSMAN.

Specification of a patent for a Machine for Shelling Corn, &c. Granted to CALVIN PAGE, *Sandbornton, Strafford county, New Hampshire, March* 13, 1834.

To all to whom these presents shall come, be it known, that I, Calvin Page, of Sandbornton, in the county of Strafford, and state of New Hampshire, have invented a new and useful machine for shelling corn, to which machine I attach also a winnowing apparatus, by which it is cleaned at the same operation; and I do hereby declare that the following is a full and exact description thereof.

The frame of the machine may be varied in its form, but that represented in the drawing thereof deposited in the patent office, I have found to be a convenient one. The shelling is effected between a cylinder and a vertical rack, or grating, which is made movable, so that it can be pressed closer to, or made to recede from, the cylinder, as may be required. The diameter and length of the cylinder, as well as the size of the other parts of the machine, are to be varied according to the power to be applied to it. The cylinder may be made of wood, and in a small machine may be a foot in diameter, and two feet in length. Upon this cylinder iron beaters or shellers are to be placed, which may consist of bars, or rods, of iron, half an inch in width, and a quarter of an inch in thickness; these are to pass spirally from end to end of the cylinder, their inclination may be such as to carry each of them about one-third of the way round the cylinder; of these there may be eight, or any other convenient number, firmly attached, so as to stand out their whole thickness from the surface of the cylinder. Motion may be given to this by means of a cog wheel acting upon a pinion on one end of an iron shaft upon which it revolves. The cylinder will answer well when standing horizontally, but it may be a little inclined towards the end from which the cobs are to escape; the spiral form of the beaters, however, may be made to force them out without this inclination.

In front of the cylinder, and extending along it from end to end, is a bar of iron, or a strip of wood faced with iron, upon which the ears of corn rest, and revolve, as they are shelled by the action of the beaters. This stands about level with the axis of the cylinder, and may be supported in its place in any convenient way. The corn is

pressed against the cylinder by the vertical rack or grating, before named. This consists of vertical slats, attached at each end to a cross piece, by which they are framed together. The lower cross piece works upon pivots, or hinges, being situated below the rest which sustains the corn, usually as low down as the under side of the cylinder. The faces of these slots should be covered with sheet iron to prevent their wearing. Against the back of this rack, and near its upper edge, two, three, or more, springs are made to press, and these may be regulated by screws bearing against them, causing the rack to approach towards, or recede from, the cylinder.

The whole machine is covered with a close case, surmounted by a hopper, or feed hole, through which the corn to be shelled falls between the cylinder and the rack; from thence the grains pass directly down, or between the slats, on to a shoe or sloping bottom, where there is a fan, or winnowing mill, operating in the ordinary way. The shaft of the fan wheel may be turned by a band from a whirl on the axis of the cylinder opposite to that on which the pinion is placed. The casing entirely prevents all scattering of the corn, whilst there are suitable doors, or shutters in it, which may be opened to inspect the work, and regulate the machine.

At that end of the rest towards which the curvature of the beaters carries the corn, there is an opening left for the escape of the cobs, which thus fall outside of the machine; the hopper, or feed hole, being at the opposite end, to insure its being completely shelled before it passes out.

I do not claim as my invention any of the parts of this machine, taken separately, nor do I claim the performing of the operation of shelling and cleaning simultaneously, this having been before effected; but what I do claim is the general construction and arrangement of the shelling part, consisting of the cylinder with its spiral beaters, the rest, and the vertical rack, constructed in the manner, and operating upon the principle hereinbefore set forth; without regard however, to any particular dimension, or materials, or to the precise form given to the respective parts.

Calvin Page.

Description of "an improvement in Stoves for Burning Anthracite or other Fuel." Patented by Abraham E. Spoor, *Coxsackie, Greene county, New York, March* 15, 1834.

The form of the stove esteemed the best by the patentee, is that of a cubical box. It has two openings in front, one for the ash pit drawer, and the other a door for the supply of fuel, about nine inches above the former. The door is to be an open frame containing mica, and its lower edge is to be level with the top of the fire, so that its whole surface may be exposed to view. Another opening is to be made either in the front or back, upon a level with the grate, for the purpose

of introducing a shaker, to remove the ashes; a longitudinal stopper is made to close this opening very perfectly.

On each side of the ash drawer are two vertical plates, leading from front to back, and dividing this lower part of the stove into three compartments, the two exterior of which are to form a portion of the flues. These plates sustain a horizontal one, which has the circular grate in its centre; this horizontal plate has its four corners removed to make openings into the compartments on each side of the ash drawer. The circular grate is detached from the horizontal plate upon which it rests, and is capable of being vibrated circularly, or of being tilted to discharge the fuel, when moved round to a certain point.

The holes in the corners of the lower plate are surrounded by vertical plates forming them into four flues; the two in front may extend two or three inches only above the top of the furnace, but the two in the rear are extended up to a sloping back, or to the top plate of the stove, and be surmounted by pipes. At about nine inches above the horizontal plate is a second, similar to it, with a round hole in its centre; this forms the top of the furnace, the space between the two plates being filled with fire brick. Above the furnace there is a sloping back plate cutting off a triangular prism at the back of the stove, and forming a chamber into which the rear flues may enter, and from which the smoke pipe of the stove leads.

The patentee claims as improvements, "the grate above described, with the mechanism for supporting it, and also the enclosed avenue for the shakers." "The internal revolving flues within the body of the stove, by which the heated air directly from the glowing mass of burning coal, in its revolution, first downward, then backward, and upwards, is brought in contact with nearly the whole internal surface of the outside plates of the stove, imparting heat to the room, and furnishing an opportunity for warming the feet." "Another improvement relates to the form of the burning mass; it is founded on the fact that anthracite does not burn so well in a square, or angular, as in a cylindrical form; and that when a mass of coal over nine inches in height becomes all ignited at once, so many ashes are formed and diffused through the mass, that it is impossible to separate the ashes effectually from the coal, without introducing the poker, and stirring it up from the bottom." "The mass of coal should be in the form of a cylinder, and in no case, whatever be the size of the stove, exceed in height eight, or at most, nine inches." "I claim as an improvement the location of the transparent door, at such an elevation as to expose the whole surface of the fire to full view."

The validity of the last claim we are constrained to doubt, as the location spoken of is that of cylindrical stoves for anthracite, in general; its location is not new, therefore, nor is it pretended that the door itself is so. Can the patentee prevent me from putting a transparent door, an old contrivance, on to a stove which I have had in use for years, in the place of the old door; we rather think not. The improvement in this stove which "relates to the form of the burning mass," is not absolutely claimed, nor do we perceive with what propri-

ety it can be alluded to as appertaining any more to this stove than to thousands of others which have been in use ever since the general introduction of anthracite. The patentee will find but few in which it has been attempted to exceed the height of nine inches in the burning column. The arrangement of the flues appears to be good, and sufficiently distinct to sustain the claim made to this particular construction.

Specification of a patent for a Machine for Dressing Staves for Barrels. Granted to SOLOMON CRUMBER, *Hemlock Township, Columbia county, Pennsylvania, March* 18, 1834.

To all whom it may concern, be it known, that I, Solomon Crumber, of Hemlock Township, in the county of Columbia, and state of Pennsylvania, have invented a new and useful machine for dressing staves for barrels, and that the following is a full and exact description thereof.

I prepare two strong knives, or cutters, which I place parallel to each other, and at such distance apart as shall be equal to the thickness of the stave to be dressed. These knives are made flat on their inner sides, and are capable of being so adjusted as to change the distance which they stand apart. Between these knives the staves are to be forced by means of a follower, or driver, having teeth upon it into which a pinion works. The machine is easily moved by hand, it being so geared as to require but little power to turn it by means of a crank. The proportions of the gearing may vary, but I have adopted the following in a machine which I have at work.

The wheel on the crank shaft is thirteen inches in diameter, and this takes into one of six feet in diameter; upon the axis of this sesond wheel there is a pinion of five inches in diameter, which takes into the teeth of the follower, or driver. This latter works up and down between suitable guides, and must be of such length as will adapt it to that of the staves to be dressed.

As the staves are sometimes winding, and require the application of force to direct them in passing between the knives, I employ an apparatus for that purpose which is constructed in the following manner. A platform, or horizontal table, extends on each side of the knife edges, and upon this I place two twisted pieces, or guiders, one to the right, and the other to the left of the knives, the edges of which may be forced up against the stave, on either side, and be made to bear more or less towards one edge or the other, as may be necessary to give a cant to it. These pieces are to be forced up by levers which are of the second kind, and lie loosely on the table. They are attached to the back ends of the twisting pieces by a joint and pin, and their extreme ends, which are their fulcra, rest and bear against a ledge, but not being held by a pin they can be slid along so as to change the point of bearing. In each of the twisting pieces there is a longitudinal slot, or mortise, which passes over a pin on the table,

by which means their edges are canted when the levers are either drawn forward, or pushed back; to prevent friction, the bearing edges of each twisting piece is formed by a roller. For an exemplification of this arrangement I refer to the drawing deposited in the Patent Office.

What I claim as my invention is the general arrangement of the before described machine; with the adjustable knives between which the staves are forced in the manner set forth; and furnished with the apparatus for canting the stave, so as to take it out of twist; whether the same be made in the form and manner herein shown, or in any other in which its principle of operation is similar.

SOLOMON CRUMBER.

Specification of a patent for an improvement in the application of Valves to Steam Engines. Granted to JOHN KIRKPATRICK, *city of Baltimore July* —, 1834.

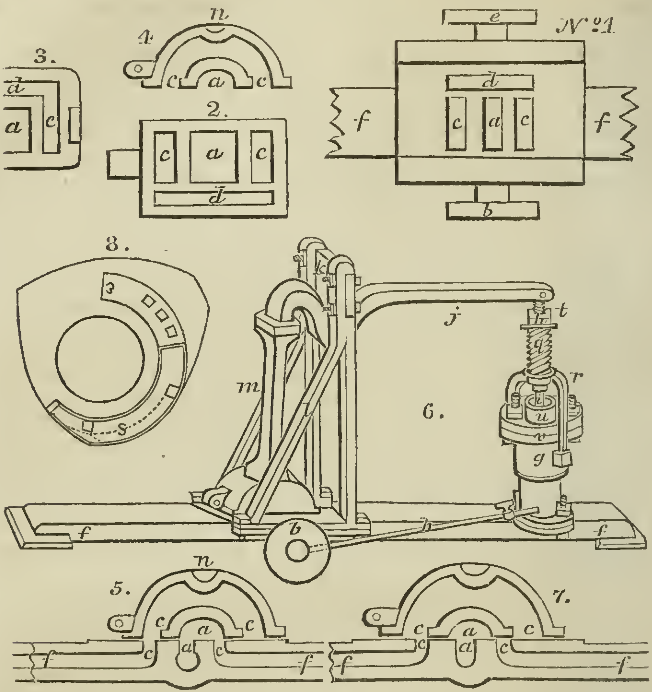
Whereas I, John Kirkpatrick, of Baltimore, in the state of Maryland, have invented a new and improved slide valve for steam engines, with an improved cam suitable to the same, which I denominate the *Self-balancing Slide Valve, and Shifting Cam;* now be it known, that in conformity with the requirements of the law granting patents for useful inventions, I do hereby declare that the following is a full and exact description of my said improved valve and cam, reference being had to the drawing which accompanies, and makes a part of this description.

I denominate this valve self-balancing, because it is so regulated that by the action of the steam itself, the pressure of the slide upon the valve seat, is always so regulated as to be the same, however much the elastic force of the steam may vary in the boilers, and other parts of the engine. The cam I denominate shifting, because by shifting a circular plate attached to it, backward or forward, the steam is cut off earlier or later in the stroke, which is often required by changes of fuel, or resistance of the engine.

In some respects, this valve and cam, but more especially the latter, are similar to others now in use, and to such parts which are so, I, of course, make no claim; but, besides the self-balancing apparatus, to be presently described, there are some points in the arrangement of the steam ways, in the valve, and valve seat, which are new and which I consider as improvements.

No. 1, in the accompanying drawing, represents a valve seat, placed upon the ordinary side pipe of an engine, and shown in what I esteem the proper proportions for an eccentric motion. No. 2 represents the face of the slide which is adapted to No. 1. No. 3 is a section through the middle of the slide in a transverse direction, and vertical to its face. No. 4 is a similar section, longitudinally. No. 5 shows a similar section of the valve, its seat, and a portion of the side pipe. No. 6 is a perspective view of the whole self-balancing valve, and its appendages, excepting the cam. No. 7 is a modifica-

tion of the valve and seat, to shut off at any part of the stroke which may be determined upon. No. 8 is a shifting cam suitable for No. 7, the shifting projection plate being set at half stroke.



In No. 1 the opening *a* is for the admission of steam into the cylinder, through the steam pipe *b*. The two parallel openings *c c* are for the alternate admission and escape of steam to and from the two ends of the cylinder, being conducted into them through the cavity in the valve *a*, and from them in the slide, by the passages in the valve *c c*, to the longitudinal cavity *d*, thence to the longitudinal passage in the seat *d*, thence out through the escape pipe *e*. The corresponding openings in the valve and seat, are designated by the same letters. The openings *a c c* of the seat, are all of the same dimensions. The opening *d* is of the same width with them, and in length equal to the width of the three, and the spaces between them.

In the valve No. 2, the centre opening, or cavity, *a*, which may be denominated the steam chest, must be sufficiently wide to embrace the centre opening *a*, and one of the end openings, *c*, of the seat. In sliding, therefore, by means of a cam or eccentric motion, the steam will be alternately admitted into, and discharged from, each end of the cylinder *f f*, through the different openings of the valve and seat.

For shutting off at half stroke, or at any other desired point, the

construction of the valve is the same as that already described, but there is a difference in the proportion of the openings and spaces. In No. 7, the middle opening of the seat is of double the width of the two end ones *c c*. The spaces between them are of the same width with the middle opening, and the cavity *e* of the valve, or steam chest, extends from the centre of the middle opening to the extreme edge of either of the end openings, or the centre opening of the seat may be rather less than twice the width of one of the end openings, and the spaces rather less than that: the proportions of the valve will of course vary with that of the seat. Every competent engineer will readily perceive the effect of this arrangement, and how it may be varied and adapted to shut off at any desired part of the stroke, by moving backward, or forward, the circular plate S, of the shifting cam No. 8. The dotted line shows the form of the cam when the plate is shifted on to *w*.

In No. 6, *b* is the steam pipe, and *g* is a cylinder, or chamber, for containing a piston, or plunger, into the lower end of which cylinder steam is admitted through the tube *h*. The piston rod *i*, extends up to, and is connected with, the lever *j*, which has a knife edge or circular fulcrum under the cross piece *k* of the frame *l*. The stem *m*, has a cavity in the upper end to receive the end of the lever; and there is a similar cavity *n*, in the valve, to receive the lower end of the stem. This mode of forming the joints, although not essential to the general plan, is extremely convenient, as it affords ample bearings, which may be made to move in oil; it also allows the valve to be taken away, without the trouble of turning a screw, and replaced in the same manner. The size of the plunger, or piston, in *g*, must be such as shall produce the self-balancing effect, operating by means of the lever upon the valve; in making this calculation, the area of one of the end openings of the seat, added to the area of the steam chest, or cavity of the valve, is the area of the plunger, or piston, with a lever of equal length at both ends; but as the end of the lever next the plunger will be longer than that next to the valve, so, inversely, will the area of the plunger be less than the area of the steam chest, and one of the end openings.

The nut *p* upon the piston rod acts upon the spiral spring *q*, which has its lower bearing upon the bow *r*, and by means of this, the degree of friction may be regulated. On the inside of the spiral spring *q*, is a cylinder with a flanch *t*, directly below the nut *p;* this cylinder is to protect the screw on the upper part of the piston rod *i*; the lower end of the cylinder passes through the upper part of the bow *r;* the lower end of the piston rod terminates at the bottom of the hollow of the plunger *u*, which should be about the centre of the shifting box *v;* the vibration is thus taken from the plunger, while the other parts connected with the lever conform freely to its action.

What I claim as my invention is the general form of the valve, and its appurtenances, as herein described, by means of which the self-balancing principle is applied, the elastic force of the steam acting upon a piston, being thereby made to react upon the valve with any desired degree of force; also the application of a shifting projection

to the cam (for purposes already described,) which combines in a single cam, the means of shutting off at any part of the stroke, with the principal motion of the valve. And I do hereby declare that I do not intend to confine myself to the precise arrangement herein shown, but to vary the same in any mannor which I may deem proper, whilst the same principle is applied, and a similar effect produced.

JOHN KIRKPATRICK.

ENGLISH PATENTS.

Specification of the patent granted to CHARLES T. MILLER, *for certain Improvements in making or Manufacturing of Candles. Sealed February* 14, 1830.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said Charles T. Miller, do hereby describe and ascertain the nature of my said invention, and the manner in which the same is to be performed, by the following description thereof, that is to say:—

My invention relates to wax, spermaceti, and composition candles, and consists of a glass ring, being introduced round the wick at the neck of each candle, thereby forming a fence round the wick.

In the manufacture of wax candles, I introduce the ring by passing it over the top, and putting it on the neck of the candle at the half-making, and in other respects these candles are to be made in the usual manner.

With respect to the spermaceti and composition candles, the mode of introducing the ring is as follows: I cotton the frames in which the candles are made in the usual manner. I then put a ring round each wick at the top part of the frames; that is, at the part which forms the bottoms of the candles. When the frames are turned down, the rings fall to the bottoms of the pipes, that is, to the parts which form the tops of the candles, and when the melted ingredient is poured in, the ring will be properly fixed in the neck of the candle.

In the spermaceti and composition candles I use the platted wicks, which are now in general use, but I do not claim this kind of wick as my invention.

No. 1. *No.* 2. *No.* 3.

The rings which I use are made of solid round glass, and I use three sizes, designated as above by the numbers 1, 2, 3. No. 1, the largest, I use for short twos. No. 2, for long twos and short threes,

and for all candles of the same thickness; and No. 3 for all candles not so thick as short threes.

Rep. Pat. Inv.

Specification of the patent granted to GEORGE FREDERICK MUNTZ, *for an improved manufacture of Boilers used for the purpose of Generating Steam. Sealed October* 8, 1833.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said George Frederick Muntz, do hereby declare the nature of my said invention to consist in the application to the manufacture of steam boilers, of a certain alloy of copper and zinc, the nature of which is set forth and described in the specifications of two certain patents granted to me, the said George Frederick Muntz, the one bearing date at Westminster, the 22nd day of October, 1832, entitled "An improved manufacture of metal plates, for sheathing the bottoms of ships, or other such vessels;"* the other also bearing date at Westminster, the 17th day of December, 1832, entitled "An improved manufacture of bolts, and other, the like, ship's fastenings;"† specifications of which said two last mentioned patents were duly enrolled in his said Majesty's high court of chancery, within the time limited for that purpose, reference being had thereto respectively will more fully appear; and which said specifications contain the following description of the said alloy, that is to say:—

"The said alloy is composed of copper and zinc of the following qualities and proportions, that is to say,—I take fine copper, called best selected copper, and good zinc, and melt them together in the usual way, in any proportions between fifty parts of copper to fifty parts of zinc, and sixty-three parts of copper to thirty-seven parts of zinc, both of which extremes, and all intermediate proportions, will work at a red heat, but I prefer, in all cases, the alloy to consist of about sixty parts of copper to forty parts of zinc. This compound I cast into ingots of any convenient weight, and then heat them to a red heat and roll them into sheets, or hammer, or otherwise work them into bolts, in the same manner as copper is rolled and worked, only taking care not to overheat the metal so as to produce fusion, and not to put it through the rollers, or hammer, or work it after the heat has left it too much, say when the red heat goes off."

Now whereas it is evident that the said alloy may also be made from a compound of copper and calamine, by cementation, taking care that the quantity of calamine shall be such that the zinc extracted from it will be in some of the same proportions to the copper as before mentioned, but as it is very difficult to make the copper take up the necessary quantity of zinc by this process, it is more expensive. It is equally evident, that brass of very good quality, with the

* For an account of this patent, see Jour. Frank. Inst. vol. xii. p. 195.

† For specification of this patent, see ,, ,, ,, vol. xiii. p. 45.

addition of zinc requisite to make the proper proportions of copper and zinc, will likewise work and roll hot, and answer the purpose, but is again a more expensive mode. I therefore prefer and adopt the process hereinbefore first described for making the said alloy.

Now whereas the said alloy may be made into rivets as well as bolts, or drawn into pipes, both which may be necessary for the purpose of making steam engine boilers; and I claim as my invention the application of the said alloy to the manufacture of boilers used for the purpose of generating steam for steam boilers manufactured out of the said alloy, whereby they may be made more light, durable, and cheap than where copper is used. [*Ibid.*

To Louis Quetin, *for an invention of a new or improved vehicle, or combination of vehicles, for the carriage or conveyance of passengers, and also luggage and goods, constructed upon a principle of security against overturning or upsetting, and possessing other advantages which he conceives will be of public utility. Sealed July* 25, 1829.

This is an extraordinary project for obtaining safety, and preventing a carriage from overturning, consisting of a plan for running the carriage upon a single wheel.

A broad wheel, or rather a bowl-shaped roller, is provided with an elongated axle extending at both ends. To this axle a strong rectangular horizontal frame is attached, with uprights, called a cage, circumscribing the wheel on which carriage bodies, with suitable boxes, or boots, are fixed by the sides of the wheel, before and behind it, and also on the top. These carriage bodies and boots are to be so exactly balanced, that the whole weight may be supported and poised upon the wheel, or roller, in the centre.

The construction of such a ponderous vehicle may be readily conceived. The frame work, or cage, that is to circumscribe the central wheel, must be made exceedingly strong in order to support the carriage bodies, which may be formed agreeable to the taste of the builder, or in the usual appearance of carriage bodies suited to receive passengers, having capacious boxes, or boots, as magazines beneath for the stowage of heavy goods and luggage. On the tops of these carriage bodies cabriolas are to be placed for outside passengers; and the whole, that is, the carriage bodies, boots, or magazines, and cabriolas, are to be so mounted upon springs connected with the framework, or cage, that any concussions caused by passing over obstructions on the road may be neutralized.

As the vehicle may be subjected to some vibratory or swinging action in its travelling upon roads, there are to be anti-friction rollers attached under the carriage magazines, or boots, at the sides, which come in contact with the ground in case of any preponderance of either side of the vehicle, allowing the carriage to roll on without obstruction.

The vehicle is to be drawn by horses, as other carriages, having a pole in front; and we presume that the bowl shape of the wheel will allow of its turning, without much difficulty, to the right or left, out of the straight course.

A variation of this scheme is also described, but the precise construction of which we do not exactly perceive. It is proposed that a broad wheel of large diameter without spokes should be employed, within which a carriage body is to be suspended by some means which are not intelligibly explained. We presume that the carriage body is to hang upon gimbles, or universal joints, within the wheel, as it is stated that its erect position is to be preserved by weighting the under part of the carriage body, which, as the wheel goes round, will preserve its position by means of its gravity.

[*Lond. Jour.*

ON THE MANUFACTURE OF VARNISHES.

(Continued from p. 140.)

On the Choice of Linseed Oil.

The choice of linseed oil is of peculiar consequence to the varnish maker, as upon its quality, to a great extent, depends the beauty and durability of the varnish. Oil expressed from green, unripe seed, always abounds with watery, pulpy, acidulous particles. The quality of oil may be determined in the following manner:—Fill a phial with oil, and hold it up to the light; if bad, it will appear opaque, turbid, and thick; its taste is acid and bitter upon the tongue, and it smells rancid and strong: this ought to be rejected. Oil from fine, full grown, ripe seed, when viewed in a phial, will appear limpid, pale, and brilliant; it is mellow and sweet to the taste, has very little smell, is specifically lighter than impure oil, and when clarified dries quickly and firmly, and does not materially change the colour of the varnish when made, but appears limpid and brilliant.

On Essential Oil, or Spirits of Turpentine.

That which is used for mixing varnish ought to be procured and chosen as pure, strong, and free from acid as possible. Some turpentine being drawn from green trees abounds with a pyroligneous acid, which rises and comes over with the spirit in distillation; it is strong and bitter to the taste, and appears milky, particularly towards the bottom, after standing to settle. Therefore, the longer turpentine is kept before it is used, the purer and freer it will be from acid at the top of the cistern, as all its impurities will fall to the bottom, and will be found unfit for any purpose in making varnish.

On the Choice of Dryers used in Varnishes.

The dryers hitherto used in the making of varnishes have been used either without care or judgment, in the most injurious manner, it being the common practice to introduce great quantities of red lead,

common litharge, sugar of lead, and foreign white copperas, raw Turkey amber, &c., without either considering the proper quality or quantity, which have had the most injurious effects on the delicate colours upon which varnishes so made, (or rather so spoiled,) have been applied.

Sugar of lead, when bought for the purpose of adding to varnish as a drier, ought to be that which has been made from white lead, and not that which has been made from litharge, that from white lead being the finest, and in its particles purer and transparent. All sugar of lead contains about 14.2 per cent. of the water of crystallization, so that to use it in that state is very injurious to the varnish, as its water prevents that complete union of the particles of gum, oil, and lead, which ought to combine instantly and form a whole; therefore it is necessary to bruise the sugar of lead into powder, and lay it upon cartridge paper over a warm drying stove, and keep turning it and moving it about, to prevent its running into a mass, until it gradually dries; it will then feel quite fine and soft, resembling hair powder: afterwards sift it through a forty mesh sieve; it is then fit for dryers. Keep it closed up in a dry stone jar until used, otherwise it will absorb moisture from the air.

White Copperas, or Sulphate of Zinc.—The foreign article of this name is chiefly imported from Germany, is that which is generally used as a drier for varnishes, and in its undried state is more objectionable than the sugar of lead, because it both discolours the varnish and injures the oil, by affecting both its elasticity and durability.—Another objection to its use in this state is, that it requires the varnish to be kept for many months to settle; and if the varnish is not made very thin, it will never get clear of the zinc near the bottom of the cistern. It is, therefore, necessary to bruise and dry it exactly as before directed for the sugar of lead. Sift and keep it from the air until the time it is wanted for use. This is the strongest and most effective drier when carefully dried and sifted, because it is then entirely freed from its watery particles. From its astringent quality, it immediately seizes on any aqueous particles, whether from the oil, gum, or turpentine, if a sufficient quantity is used. Such is its astringent and absorbant quality, that if even water were mixed with the varnish, the copperas would sieze upon, and carry it down to the bottom; neither will it ever combine with the oil as calces of lead do.

Litharge is to be chosen as free from extraneous earthy matter as possible: that which is from the richest and softest lead is the best, and is termed "wind-blown," or WB; it is in large broad flakes, or scales, appears very bright, skins, and feels soft between the finger and thumb when rubbed; whereas the bad quality is distinguishable by an opaque, dull, or earthy appearance, and feels hard and gritty to the touch, and is very full of extraneous matters: this ought always to be rejected, as also all ground litharge; for it is easy to conceive the injury a mixture of impure lead, iron, and impure earthy matters, would occasion if introduced into varnish.

Red Lead, like litharge, ought to be chosen as free from earthy and extraneous matter as possible. A great quantity of red lead is adul-

terated with earths, ochres, &c., therefore procure that which is most pure: it is known from its strong, clear, bright colour, by its weight, or, if worth while, it may be easily analysed. The best red lead is a strong and efficient drier, when it can be used with safety.

Turkey Amber has been, and is still, used by many as a dryer. I, like many others, used it for years, but, from experience, I found it contained nothing of a particular drying quality, being only a mixture of clay, iron, vitriol, zinc, &c. I found it prevented every thing from settling into which it was introduced for a length of time, and I therefore discontinued it. Its best quality is that of an absorbent.

Asphaltum.

There are so many various qualities and descriptions of asphaltum, that it is very difficult to distinguish the good from the bad. There is asphaltum from China, Egypt, France, Neufchatel, and Naples, and many sorts now made in England.

The best which I have found is a native mineral, or genuine Egyptian; it is black, glossy, and heavy, and, when rubbed upon a hot poker, readily melts. It emits a very strong, disagreeable smell, like that of garlick, or assafœtida. It will neither dissolve in oil, water, nor turpentine. It is, in general, when imported, covered with a coat of dust or clay, and mixed with stones, gravel, &c. This Egyptian asphaltum must be fused, of which read hereafter.

Next in goodness is the Naples, which resembles the other in its external qualities. It is much freer from dirt, will dissolve in oil, but it never yields that intense black to the same quantity of oil as the real Egyptian. There are several varieties of Naples, French, and German, which will all dissolve in oil, and have very little difference in quality, only I have always found the softest and most fluid the best; yet of late there is asphaltum made in England, and particularly in London, which comes very near in quality to the best French, Naples, or German. It is the residiuum left from the burning of rosin, pitch, or linseed oil, which the makers of lamp-black burn for the purpose of condensing. Linseed oil, burnt by itself, produces scarcely any residium, but when joined with rosin, it leaves a very fine asphaltum, not inferior to the best Egyptium; but the asphaltum from pitch is very inferior, as it is coarse, gravelly, and never hardens properly. It has a brown hue or tint. As for the asphaltum made from gas tar, it is unfit either for black japan or Brunswick black, and fit only for inferior purposes.

Having described the apparatus, and most of the necessary ingredients, with their relative qualities, it is now proper to give directions how the various varnishes are made, with their component parts, and the various uses they are intended for, beginning upon a scale which every operator or maker can act upon, as may best suit his own inclinations or circumstances; premising that the before mentioned general instructions and precautions are always to be strictly borne in mind.

How to make Copal Varnishes for fine Paintings, &c.

Fuse eight pounds of the very cleanest pale African gum copal, and, when completely run fluid, pour in two gallons of hot oil, old measure; let it boil until it will string very strong; and in about fifteen minutes, or while it is yet very hot, pour in three gallons of turpentine, old measure, and got from the top of a cistern. Perhaps, during the mixing, a considerable quantity of the turpentine will escape, but the varnish will be so much the brighter, transparent, and fluid, and will work freer, dry quickly, and be very solid and durable when dry. After the varnish has been strained, if it is found too thick, before it is quite cold, heat as much turpentine and mix with it as will bring it to a proper consistence.

Artists' Virgin Copal.

From a select parcel of scraped African gum copal, before it is broke, pick out the very fine transparent pieces, which appear round and pale like drops of crystal; break these very small; dry them in the sun, or by a very gentle fire. Afterwards, when cool, bruise or pound them into a coarse powder; then procure some broken bottles, or flint glass, and boil the same in soft water and soda, then bruise it into coarse powder like the gum; boil it a second time, and strain the water from it, washing it with three or four waters, that it may be perfectly clean and free from grease or any impurity; dry it before the fire, or upon a plate set in an oven. When it is thoroughly dry, mix two pounds of it with three pounds of the powdered copal; after mixing them well, put them into the gum pot and fuse the gum; keep stirring all the time; the glass will prevent the gum from adhering together, so that a very moderate fire will cause the gum to fuse. When it appears sufficiently run, have ready three quarts of clarified oil, very hot, to pour in. Afterwards let it boil until it strings freely between the fingers; begin and mix it rather hotter than if it were body varnish, for as there is but a small quantity, it will be sooner cold; pour in five quarts of old turpentine, strain it immediately, and pour it into an open jar, or large glass bottle; expose it to the air and light, but keep it both from the sun and wet, and from moisture, until it is of a sufficient age for use. This is the finest copal varnish for fine paintings or pictures.

Cabinet Varnish.

Fuse seven pounds of very fine African gum copal, and pour in half a gallon of pale clarified oil; in three or four minutes after, if it feel stringy, take it out of doors, or into another building where there is no fire, and mix with it three gallons of turpentine; afterwards strain it, and put it aside for use. This, if properly boiled, will dry in ten minutes; but if too strongly boiled, will not mix at all with the turpentine; and *sometimes*, when boiled with the turpentine, will mix, and yet refuse to amalgamate with any other varnish less boiled than itself; therefore it requires a nicety which is only to be learned from practice. This varnish is chiefly intended for the use of japanners, cabinet painters, coach painters, &c.

Best Body Copal Varnish for Coach Makers, &c.

This is intended for the body parts of coaches and other similar vehicles intended for polishing.

Fuse eight pounds of fine African gum copal; add two gallons of clarified oil (old measure;) boil it very slowly for four or five hours, until quite stringy; mix off with three gallons and a half of turpentine; strain off, and pour it into a cistern.

Observe, these varnishes, by being made in the gum pot, and entirely without driers, are on that account much paler than when each run is poured into the boiling pot, and afterwards boiled off. Varnish made entirely from African copal possesses more fluidity, pliability, and softness, than varnishes made with, or entirely from, gum anime; it also possesses a property of keeping its colour, or rather becoming bleached or paler after it is applied; whereas, varnishes made from gum anime always become darker after being applied. Genuine copal varnishes, from their pliability and softness, are rather slow in drying, and retain for months so much softness that they will not polish well until they give out a moisture and become hard; then they wear well, will never crack, and always retain their polish. As they are too slow in drying, coach makers, painters, and varnish makers, to remedy that defect, have introduced to two pots of the preceding varnish, one made as follows—

$$\left.\begin{array}{l}\text{8 lbs. of fine pale gum anime,}\\ \text{2 gallons of clarified oil,}\\ 3\tfrac{1}{2}\text{ gallons of turpentine,}\end{array}\right\}\text{to be boiled four hours.}$$

This, after being strained, is put hot into the two former pots, and well mixed together; its effect is to cause the whole to dry quicker and firmer, and enable it to take the polish much sooner.

Some varnish makers, contrary to their own judgment, introduce into each small pot of varnish from half to one pound of either sugar of lead, or white copperas, and sometimes only half of each; but no varnish made with dryers will be so brilliant, colourless, pliable, or wear so long, as that made without it. Every description of varnish which has lead for driers will always be the harder for them, and when worn for a time, if minutely looked into, it will be found that the air has separated the particles of lead, which will be found upon the polished surface of the varnish, like an almost imperceptible white dust, exactly in proportion to the quantity of lead introduced into the varnish in making it.

Common Body Varnish, for the same purposes as the first.

$$\left.\begin{array}{l}\text{8 lbs. of the best African copal,}\\ \text{3 gallons of clarified oil,}\\ 3\tfrac{1}{2}\text{ gallons of turpentine,}\end{array}\right\}\text{boiled four hours, or until stringy,}$$

mixed, and strained, will produce about five gallons and a half.

$$\left.\begin{array}{l}\text{8 lbs. of the best gum anime,}\\ \text{2 gallons of clarified oil,}\\ 3\tfrac{1}{2}\text{ gallons of turpentine,}\end{array}\right\}\text{boiled as usual,}$$

mixed, and strained hot, and put into the former pot of African gum

varnish. Put two pots of this anime varnish to one of copal; it will dry quicker and harder than the best body copal, and will polish very soon, but not wear either so long or so well.

Quick-drying Body Copal Varnish for Coaches, &c.

8 lbs. of the best African copal, 2 gallons of clarified oil, ¼ lb. of dried sugar of lead, 3½ gallons of turpentine,	boiled until stringy, and mixed and strained.
8 lbs. of fine gum anime, 2 gallons of clarified oil, ¼ lb. of white copperas, 3½ gallons of turpentine,	boiled as before,

to be mixed and strained, while hot, into the other pot. These two pots mixed together, will dry in six hours in winter, and in four in summer: it is very useful for varnishing old work on dark colours, &c.

Best Pale Carriage Varnish.

8 lbs. 2nd sorted African copal, 2½ gallons of clarified oil,	boiled till very stringy.
¼ lb. of dried copperas, ¼ lb. of litharge, 5½ gallons of turpentine,	strained, &c.
8 lbs. of 2nd sorted gum anime, 2½ gallons of clarified oil, ¼ lb. of dried sugar of lead ¼ lb. of litharge, 5½ gallons of turpentine,	mix this to the first while hot.

This varnish will dry hard, if well boiled, in four hours in summer, and in six in winter. As its name denotes, this is intended for the varnishing of the wheels, springs, and carriage parts of coaches, chaises, &c.; also, it is that description of varnish which is generally sold to and used by house painters, decorators, &c., as, from its drying quality, and strong gloss, it suits their general purposes well.

Second Carriage Varnish.

8 lbs. of 2nd sorted gum anime, 2¾ gallons of fine clarified oil, 5¼ gallons of turpentine, ¼ lb. of litharge, ¼ lb. of dried sugar of lead, ¼ lb. of dried copperas,	boiled and mixed as before.

When three runs are poured into the boiling pot, and the regular proportion of driers put in, and well boiled, this varnish will dry hard and firm in four hours in winter, and in two in summer: it is principally intended for varnishing dark carriage work, or black japan, and is also used by house painters for dark work.

Wainscot Varnish.

8 lbs. of 2nd sorted gum anime, 3 gallons of clarified oil, ¼ lb. of litharge, ¼ lb. of dried copperas, ¼ lb. of dried sugar of lead, 5½ gallons of turpentine,	to be all well boiled until it strings very strong, and then mixed and strained.

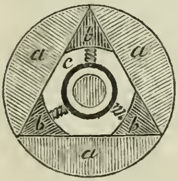
N.B. When large quantities are required, it will always be found best to boil off the three runs in the boiling pot. This varnish is principally intended for house painters, grainers, builders, and japanners; it will dry in two hours in summer, and in four in winter.

Mahogany varnish is either made with the same proportions, with a little darker gum; otherwise it is wainscot varnish, with a small portion of gold size.

[TO BE CONTINUED.]

Heaton's Improved Metallic Piston.

In Barton's piston, the three springs which force out the wedges reach against the piston-rod, and are quite independent of each other. In this piston, as constructed by the Messrs. Heaton, a more perfect arrangement exists, which will be made intelligible by the following sketch:—



a a a are the three metal segments; *b b b* are the protruding wedges acted upon by three spiral springs, which react separately and simultaneously against a steel ring, *c*, which surrounds the piston-rod at same little distance. The advantage of this arrangement consists in the uniform distribution of pressure throughout the apparatus.

In the event of one spring being much stronger than another, in Barton's mode of construction, one wedge is pushed forward with more force than the others, and unequal wearing is the consequence; in Heaton's piston, on the contrary, any excess of strength in one spring is met by the yielding of the others,—the most perfect self-adjustment taking place.

The ring *c* is itself a spring to a certain extent, aiding and assisting the action of the others; and although it may not always be found in the centre of the piston, yet will it invariably be found in the true *centre of the combined forces*, producing the most perfect equilibrium in all the parts, and thus affording a steam-tight piston, with a minimum quantity of pressure, and, consequently, of friction also.

[*Mech. Mag.*

CELESTIAL PHENOMENA, FOR OCTOBER, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.				
14	15	7	Im. (249) Piscium	,6,	N132°	V150°
14	16	8	Em.		315°	355°
17	17	44	N App. ☽ and ξ Ceti, ,5, ☽ North 4'.7			
21	9	36	Im. 103 Tauri	,7,	95°	148°
21	10	39	Em.		305°	359°
22	13	37	Im. 8 Geminorum	,7,	20°	71°
22	13	51	Em.		362°	308°
23	8	48	Im. 42 ϖ' Geminorum	,6,	128°	186°
23	9	32	Em.		246°	288°
23	13	25	Im. 48 *m* Geminorum	,6,	45°	101°
23	14	10	Em.		329°	336°

Meteorological Observations for July, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	60°	83°	29.95	30.00	W.	Moderate.	0.45	Clear—rain in night.
	2	70	88	.85	.35	W.	Breeze.		Showers—sultry—lightning.
	3	72	82	.70	.75	W.	do.		Clear—lightly cloudy.
	4	82	84	.25	29.30	E.	Calm.		Cloudy day.
	5	71	82	.30	.30	W.	do.		Cloudy—flying clouds.
⊗	6	72	92	.30	.30	W.	do.		Cloudy—fog—clear.
	7	72	90	.80	.80	W.	do.		Lightly cloudy—clear.
	8	74	94	.80	.80	W.	do.		Clear—flying clouds.
	9	76	95	.80	.80	W.	Breeze.		Foggy—clear.
	10	76	87	.75	.75	Variable.	do.	0.05	Cloudy—showery.
	11	66	80	.90	.95	NW.	do.		Cloudy—clear.
	12	62	78	.96	30.00	E.	do		Cloudy day.
☾	13	69	70	30.05	.05	E.	do.	0.07	Cloudy—drizzle.
	14	68	88	.10	.10	W.	do.		Clear—flying clouds.
	15	72	91	.10	.00	W.	do.		Clear do.
	16	70	89	29.95	29.95	W.	do.	0.01	Cloudy—flying clouds—shower.
	17	74	90	.95	.90	W.	do.	0.65	Clear—rain.
	18	64	74	30.00	30.10	NE.	do.		Cloudy—flying clouds.
	19	59	76	.75	.75	E.	do.		Cloudy—flying clouds.
☉	20	64	79	.70	.70	E.	do.		Lightly cloudy—flying clouds.
	21	66	83	.05	.00	W.	do.		Clear day.
	22	70	89	29.85	29.87	W.	do.		Clear day.
	23	70	89	.90	.90	NE.	do.		Cloudy—clear.
	24	72	93	.85	.85	W.	do.		Clear—sultry—gale .
	25	70	92	.80	.80	W.	Calm.		Clear day.
	26	74	94	.75	.80	SW.	do.		Clear day.
	27	76	94	.80	.85	W.	Breeze.		Clear day.
☽	28	72	90	.80	.80	W.	do.		Clear day.
	29	68	75	.75	.75	Variable.	do.	1.63	Rain, thunder & lightning—flying [clouds.
	30	60	78	.95	.95	W.	do.		Clear day.
	31	64	77	.85	.80	SE.	do.	0.50	Rain—cloudy.
	Mean	69.51	85.35	29.88	29.94			3.36	

Thermometer.		Barometer.
Maximum height during the month,	95. on 9th.	30.75 on 3d & 19th.
Minimum do. .	59. on 19th.	29.25 on 4th.
Mean do. .	77.43 .	29.91

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

OCTOBER, 1834.

Proposed Regulations for Vessels Propelled by Steam.

The following bill was reported by the committee on naval affairs of the Senate of the United States, on the 12th of June last, not with a view to its being acted upon during the late session, which was then drawing to a close, but preparatory to a more enlightened procedure hereafter, and, with this view, we now publish it, and hope that the journals of the day may make it extensively known, and thus afford an opportunity to those who are informed upon the subject, to suggest such ideas as may tend to render the act, when passed, as pefect as possible. Any communications having this object in view, addressed to the Editor, or to the Actuary of the Franklin Institute, will be laid before the Committee of Congress, at the next session, in such a way as shall appear most likely to render them useful.

In giving this notice, the Editor would remark, that it is not intended to invite the communication of any specific plan for preventing explosions, however valuable it may be in the eyes of its inventor, or in itself; such plans may be spread out upon the pages of the Journal, but the legislation of Congress upon the subject, must be of a general character, enforcing the adoption of those precautionary means which are applicable to engines of every description. It will be time enough to adopt the plan of an individual after he shall have carried it into operation to such an extent that the evidence of continued use in nu-

merous and trying cases, shall have left no doubt of its efficiency; an event not likely to be one of early occurrence.

EDITOR.

A BILL

For the Regulation of Vessels propelled in the whole, or in part, by Steam.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be the duty of all owners of steam-boats, or vessels propelled in the whole, or in part, by steam, on or before the first day of October, one thousand eight hundred and thirty-four, to make a new enrolment of the same under the existing laws of the United States, and to take out from the collector or surveyor of the port, as the case may be, where such steam boat, or vessel, is enrolled, a new license, under such conditions as are now imposed by law, and as shall be imposed by this act.

Sec. 2. *And be it further enacted*, That it shall not be lawful for the owner, master, or captain, of any steam-boat, or vessel, propelled in the whole, or in part, by steam, to transport any goods, wares, and merchandise, or passengers, in, or upon, the bays, lakes, rivers, or other navigable waters of the United States, from and after the said first day of October, one thousand eight hundred and thirty-four, without having first obtained from the proper officer, a license under the existing laws, and without having complied with the conditions imposed by this act; and for each and every violation of this section, the owner, or owners, of said steam-boat, or vessel, shall forfeit and pay to the United States, the sum of .

Sec. 3. *And be it further enacted*, That it shall be the duty of the President to appoint at such ports on the navigable waters, bays, lakes, and rivers, of the United States, as in his judgment will be most convenient to the owners and masters of steam-boats and vessels propelled in the whole, or in part, by steam, one or more persons of competent skill, to make inspections of such boats and vessels, and of the boilers and machinery employed in the same, whose duty it shall be to make such inspections when called upon for that purpose, and to give to the owner or master of such boat or vessel duplicate certificates of all such inspections, and the said person, so appointed, shall, before entering upon the duties of said appointment, take an oath, before some competent authority, faithfully to perform and discharge the same.

Sec. 4. *And be it further enacted*, That the person who shall be called upon to inspect the hull of any steam-boat, or vessel, under the provisions of this act, shall, after a careful and thorough examination of the same, give to the owner, or master, as the case may be, a certificate, in which shall be stated the age of said boat, or vessel, when, and where, orginally built, and the length of time the same has been running, and his opinion whether the said boat or vessel, be

sound, and fit to be employed for the transportation of passengers or freight; for which service, so performed, on every such boat, or vessel, the said inspector shall be allowed and paid by the owner or master thereof, and before the delivery of said certificate, the sum of   dollars, for every boat, or vessel, of less than one hundred tons, and the sum of   dollars for every boat, or vessel, of one hundred tons and upwards.

Sec. 5. *And be it further enacted*, That it shall be the duty of the person who shall be called upon to inspect the boilers and machinery of any steam-boat, or vessel, in conformity to the provisions of the third section of this act, carefully, fully, and thoroughly, to inspect and examine the engine and machinery of said boat, or vessel, and to state his opinion of its soundness; and he shall moreover provide himself with a suitable hydraulic pump, and, after examining into the state and condition of the boiler, or boilers, of such boat, or vessel, it shall be his duty to test the strength and soundness of said boiler, or boilers, by applying to the same an hydraulic pressure equal to three times the pressure which the boilers are allowed to carry in steam; and if he shall be of opinion, after such examination and test, that the said machinery and boilers are sound and fit for use, he shall deliver to the owner, or master, of such vessel, or boat, duplicate certificates to that effect, stating therein the age of the said boilers, and the weight, or proportion, of steam which may with safety be carried by said boilers, and which shall in no case exceed one-third part of the weight, or pressure, which said boilers may bear without danger of explosion or injury, one of which certificates it shall be the duty of the said master, or owner, to deliver to the collector, or surveyor of the port, wherever he shall apply for license, or for renewal of license; the other he shall cause to be posted up and kept in some conspicuous part of said boat, or vessel, for the information of the public; and for each and every inspection of the said machinery, and inspection and test of the said boiler, or boilers, the said inspector shall be allowed and paid by the owner, or master, thereof, and before the delivery of the said certificates, the sum of   dollars.

Sec. 6. *And be it further enacted*, That it shall be the duty of the owners, or masters, of said boats, or vessels, to cause the inspection provided for by the fourth section of this act to be made at least once in every twelve months; and the examination of the machinery, and the examination and test of the boilers, as provided in the fifth section hereof, to be made at least once in every three months; and to deliver to the collector or surveyor of the port where such boat, or vessel, has been enrolled or licensed, the certificate of such inspection: and on failure thereof, he, or they, shall forfeit the license granted to such boat, or vessel, and be subject to the same penalty as though he had run the said boat, or vessel, without having obtained such license.

Sec. 7. *And be it further enacted*, That whenever the master of any boat, or vessel, or the person, or persons, charged with the navigating said boat, or vessel, which is propelled in the whole, or in part, by steam, shall stop the motion, or headway, of said boat, or vessel;

or when the said boat, or vessel, shall be stopped for the purpose of discharging, or taking in cargo, or passengers; or when "wooding," and the steam in the boiler, or boilers, of such boat, or vessel, shall be equal to one-third part of the ascertained strength of said boiler, or boilers; he, or they, shall keep the engine of said boat, or vessel, in motion sufficient to work the pump, give the necessary supply of water, and to keep the steam down in said boiler, or boilers, to what it is when the said boat, or vessel, is under headway, at the same time lessening the weight on the safety valve, so that it shall give way when the steam in said boiler, or boilers, is equal to   of its then ascertained strength, under the penalty of   dollars for each and every offence in neglecting or violating the requirements of this section.

Sec. 8. *And be it further enacted*, That it shall be the duty of every master, or pilot, of a steam-boat, or vessel, except those navigating tide water, when descending any river, or stream in the night, when a descending boat shall come within one half mile of an ascending steam-boat, to shut off the steam, and ring the bell, and permit his boat to float upon the current of the river until the ascending boat shall have passed; and the master and owner of the ascending boat shall then assume the responsibility of steering clear of the descending boat, and be liable in damages to the extent of the injury which may be sustained.

Sec. 9. *And be it further enacted*, That it shall be the duty of the master and owner of every steam-boat, or vessel, running in the night, to suspend three lights at least three feet above the deck of said vessel, or boat; one at the bow, another at the stern, and the third at or near the middle of said boat, or vessel, under the penalty of   dollars for each and every neglect thereof.

Sec. 10. *And be it further enacted*, That it shall be the duty of the owner and master of every steam-boat, or vessel, engaged in the transportion of freight, or passengers, to provide, and to carry with the said boat, or vessel, upon each and every voyage, or trip, one long-boat, or yawl, for each   tons of said boat, or vessel, which long-boat, or yawl, shall be competent to carry at least twelve persons; and for every failure to provide and carry said boats, or yawls, in the proportion aforesaid, the said master and owner shall forfeit and pay   dollars: and it shall also be the duty of said master and owner to provide, as a part of the necessary furniture of said boat or vessel, a suction hose, and fire engine and hose, suitable to be worked in said boat in case of fire, and to carry the same in each and every trip and voyage, in good order; and for each and every failure to provide and carry the same as hereinbefore required, said master and owner shall forfeit and pay the sum of   dollars.

Sec. 11. *And be it further enacted*, That any owner or master of any steam-boat, or vessel, who shall fail to obtain the certificates of examination hereinbefore provided for in the fourth and fifth sections of this act, shall be barred from the recovery of any claim for freight or insurance that may accrue when without said certificate; and should any loss or damage to property in such case occur, in consequence of

the unsoundness or unfitness for the transportation of freight or passengers of said boat, or vessel, or in consequence of the breaking or bursting of any part of the machinery or boilers, the owner shall be responsible to the full amount of said loss or damage.

Sec. 12. *And be it further enacted.* That the captain, or master, of any boat, or vessel, propelled in the whole or in part by steam, that may not have been examined, and obtained the certificates required by the fifth section of this act, shall, in the event of any loss or damage to property, or injury to persons, occasioned by the breaking of any part of the machinery, or the bursting of the boiler, or boilers, be subject to a fine not less than nor more than dollars, and an imprisonment of not less than , nor more than ; and that, in the event of loss of life being the result of such accident, then said captain, or master, shall be adjudged guilty of manslaughter.

Sec. 13. *And be it further enacted,* That for any accident which may occur from racing, from carrying higher steam than the quantity authorized by the certificate, from running foul of, or into, another boat, from overloading the boat, or from any other cause which it is possible to foresee and avoid, or which may occur from any cause whilst the captain, master, pilot, or engineer, shall be engaged in gambling, or attending to any game of chance or hazard, the owner of such steam-boat, or vessel, shall be subject to the penalties provided for in the eleventh section of this act; and the captain, master, pilot, or engineer, shall be respectively subject to the penalties provided for in the twelfth section hereof.

Sec. 14. *And be it further enacted,* That when gunpowder is shipped on board of any vessel, or boat, propelled in the whole, or in part, by steam, which shall at all times be stowed away at as great a distance as possible from the furnace, a written notification of the fact shall be placed in three conspicuous parts of the boat, or vessel; and in the event of such notification not being so exhibited, then for any loss of property, or life, of which the powder may be deemed the cause, the owner shall be liable to the penalties provided in the eleventh section of this act; and the captain, or master, to the penalties provided in the twelfth.

Sec. 15. *And be it further enacted,* That any person, or persons, who shall ship, or put on board, or cause to be shipped, or put on board, of any steam-boat, or vessel, any gunpowder, without giving notice thereof, at the time of making the shipment, to the master or clerk, of said boat, or vessel, shall be liable to the penalty of dollars, which may be sued for and recovered before any court of competent jurisdiction, by the owner, captain, or clerk, of said vessel, or boat, for his, or her, own use and benefit; and in case of any loss of property in consequence of gunpowder being on board of said vessel, or boat, the shipper that shall have failed to give due notice as hereinbefore required, shall be liable for all losses of property, or damage done thereto, or for any injury done to any person, or to their families; and in case of the loss of the life of any individual on board in consequence of gunpowder being on board, the person, or persons,

who shall have shipped the same without giving due notice thereof, shall, on conviction thereof, be adjudged guilty of manslaughter, and punished accordingly.

Sec. 16. *And be it further enacted,* That it shall be the duty of the person who shall be called upon to inspect the boilers and machinery of any steam-boat, or vessel, under the third and fifth sections of this act, to examine the engineer of said boat, or vessel, for the purpose of ascertaining whether he or they be sufficiently qualified for the duties of his or their stations, and to propound interrogatories which the Secretary of the Treasury shall cause to be prepared and transmitted to the said inspector, which said interrogatories, being satisfactorily answered by the engineer, or engineers, and certificates also being produced of his, or their, regular habits, said inspector shall issue duplicate certificates, or diplomas, one to the engineer, or engineers, of said boat, or vessel, and the other to the captain or owner thereof, which said certificates shall be renewed annually; and the certificate granted to the captain, or owner, of said boat, or vessel, shall be exhibited to the collector, or surveyor, of the port, whenever he shall apply for a license, or a renewal of license; and the inspector shall be allowed and paid by the   , for every such examination, the sum of   dollars.

Sec. 17. *And be it further enacted,* That for any false certificate, or one given without the thorough examination contemplated by this act, the person who may be appointed to make the examination of the hull of any steam-boat, or vessel, or of the machinery thereof, or of the boilers therein, or of the competency and habits of the engineer, or engineers, of said boat, or vessel, shall be dismissed from office, and fined not less than   nor more than   dollars, and imprisoned not less than   nor more than   .

Sec. 18. *And be it further enacted,* That all penalties, fines, and forfeitures, imposed by this act, may be sued for, and recovered in any court of the United States of competent jurisdiction, within the district, or circuit, where the same may have been incurred, in the name of the United States—one half to the use of the informer, and the other half to the use and benefit of the United States.

Notice of a Meteorological Phenomenon on the evening of the 25th of July, 1834, *with an explanation by James P. Espy, Esq.*

TO THE COMMITTEE ON PUBLICATIONS.

I send you for publication the following communication sent to me by my friend Mr. Walker, with my answer to him on the same subject.

To James P. Espy, Esq.

Dear Sir,—On the evening of the 25th of July, Dr. Thomas M'Euen and myself were in the ground east of the Academy of Na-

tural Sciences, observing the double star γ Andromedæ, which was well defined with a power of sixty; on removing this eyepiece and adjusting the focus, the star could not be seen, its sudden disappearance attracted my attention to the circumstance that a haze was travelling from N.W. to S.E., with great rapidity; its front was well defined, for in its progress a star from being bright was obscured as suddenly as by a common cloud. I mentioned the circumstance to Dr. M'Euen who, with me, observed the progress of the haze through a space of 100°, from 50° N.W. altitude to 30° S.E. in about one minute. At an interval of about four minutes the stars reappeared in the same succession as they had disappeared; and again, after a few minutes, were obscured in a similar manner. This occurrence took place at about half-past eleven o'clock, P. M. The evening was very warm—the meteors, or shooting stars, very numerous, and the deposition of dew on the object glass of the telescope, more abundant and more annoying than I have ever noticed it before. After drying the object glass, in the course of five minutes it would be so covered with dew as to render the stars indistinct, an inconvenience which Dr. M'Euen could only remedy by tying round the end of the tube a piece of white pasteboard, which extended a foot beyond the object glass.

Permit me, Sir, after detailing this occurrence to invite your attention to a similar observation, and to a very philosophical explanation of the same made by Sir John Herschel, and recorded in vol. iii. of the Memoirs of the Astronomical Society, London, p. 50, as follows:—

"I cannot forbear mentioning, though relating to a very different branch of science, (one, however, highly important to astronomers,) a meteorological phenomenon, which has often occurred to my notice, but never in so striking a manner as on the night of the 19th of April last. On that night the sky had continued perfectly cloudless, with not a breath of air stirring, and a dew so copious as to run off the telescope in streams, till about half past two, A. M. I had to take the transit of 25 *Herculis*, as a setting star, which passed at 16 h. 21 m. (per chron.) At 16 h. 8 m. one of Piazzi's stars passed and was taken; after which I continued sweeping, the heavens continuing beautifully clear. About five minutes before the expected passage of 25 *Herculis*, I noticed a dusky cloud-bank in the east; it advanced rapidly. Immediately before the transit, *Arcturus* was completely invisible: while yet in the act of bisecting my star, the edge of the haze was on it, and in less than three minutes from that time had extended to the western horizon, obliterating every star by a thick uniform coating of cloud. All the time the calm remained quite undisturbed. The least supposable rapidity of propagation in this case, is 300 miles an hour, in the direction of the sun's motion, and the cause is obviously the exact attainment of a determinate temperature in the region of the atmosphere, where the cloud formed, either by radiation or by diminution of atmospheric pressure taking

place in succession along the whole zone of the sky, and as it were pursuing the point of the heavens opposed to the sun."*

I am, dear Sir,

Yours truly and respectfully,

S. C. Walker.

To Sears C. Walker, Esq.,

Dear Sir,—I have received your communication respecting a meteoric phenomenon which occurred on the evening of the 25th of July. It was undoubtedly a most remarkable and interesting appearance, and produced by the same cause as the one described by Sir John Herschel.

It is probable, therefore, that radiation is not the cause of either, for the haze observed by you did not follow the course of the sun, but rather the opposite.

As to the other cause—cold, caused by diminished pressure and consequent rarefaction of the air, it would undoubtedly produce a haze, or cloud, if the dew point were very near the temperature of the air previous to rarefaction.

But as no cause could then be assigned for the sudden disappearance of the haze, we are compelled to reject this also, more especially as it is mere hypothesis—no observation of the barometer having been made.

As to the velocity of propagation being 300 miles per hour—this depends entirely on the supposition that the haze was at a considerable altitude; but neither is this necessary, nor even likely,—for in both cases the copious deposition of dew shows that the dew-point was at the temperature of the air, and consequently a very little greater velocity of the current of air 200 or 300 feet high, than that at the surface of the ground, (a circumstance which almost always takes place, from the friction which the air experiences below,) might cause a current of slightly lower temperature above, to overlap the one below, when the vapour below, by its own elasticity, would thrust itself up into the refrigerating stratum and be condensed within a few hundred feet of the surface of the earth. Its great angular velocity is thus easily conceived while its absolute motion may be very slow. When a stratum of air a little colder than usual does pass

* "The heat disengaged, or absorbed, by the increase or diminution of pressure from barometrical fluctuations, is an element which meteorologists have not been in the habit of taking much account of. When it is considered, however, that it affects the whole mass of the atmosphere—and that in regions where it can neither be parted with nor restored by any process but that of radiation, it acts with its full effect, which is probably much greater than can appear in experiments made in contact with masses of conducting matter,—there seems reason to believe that it may act a sensible and even a considerable part in the production of various meteorological phenomena. The connection of clouds and rain with a falling barometer, and fair weather and clear sky with a rising, is certainly not imaginary, and is explicable on no other principle. I regret that I took no notes of the height of the barometer at the time of the observation recorded in the text."

Herschel.

over our heads moving faster than the air below, it is certain from theory that the vapour below ought to become thinner by thrusting itself up into the air containing less above, and that such is the fact, I think is proved by the following extract from my meteorological journal, and many others which might be given. On the 16th July, 1830, I witnessed the following most remarkable phenomenon. The weather had been very warm and dry for some days, the dew-point nearly stationary at 74, for I had taken it very frequently, and on the day of the present occurrence, I was sitting in my yard, with the means of taking the dew-point with me, when I perceived it suddenly sink three degrees in a few minutes; and at the same time, I observed a cloud forming immediately over my head, and in a few minutes more, the whole time not half an hour, a gentle shower of rain succeeded, hardly enough to wet the pavement. Immediately after this shower the dew-point rose again to 74 its former elevation; similar phenomena have frequently been observed since, both by me and our mutual friend Professor A. D. Bache.

If I have succeeded in this brief manner, to render myself intelligible I think you will agree with me that this is the true explanation of this curious phenomenon.

I am, yours, very truly,

J. P. Espy.

Rev. Mr. Whewell's Notice in relation to the Science of the Tides, together with directions for Tide Observations.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—It is no doubt well known to you, and to those of your readers who follow the progress of general science, that the Rev. Mr. Whewell, of Trinity College, Cambridge, is engaged in endeavouring to advance the important, and hitherto, comparatively, neglected, science of the tides, the first results of these investigations being the memoir on, and map of, cotidal lines, contained in the Transactions of the Royal Society of London, for 1833. Through the kindness of a mutual friend, I have received the articles,* also from the pen of Mr. Whewell, on the subject just referred to, which accompany this note, and which I should feel obliged by your inserting in that part of the Journal of the Institute where they will be most likely to meet the eye of any one who may be disposed to contribute good tide observations to the stock which Mr. Whewell is now accumulating, for the further elucidation of his subject. By this publication I shall probably best comply with the wishes expressed by Mr. Whewell. In addition I have only to offer to communicate to that gentleman any observations which may be addressed to me, and in the way which the author may desire.

Very respectfully yours,

Philada. Aug. 26, 1834. A. D. Bache.

* On the present state of the Science of the Tides. Directions for Tide Observations, Nos. 1, 2, and 3.

On the present state of the Science of the Tides. By the Rev. W. WHEWELL, *Fellow and Tutor of Trinity College, Cambridge.*

The state of our information concerning the tides is at present exciting considerable attention among English mathematicians; and it will probably not be long before we shall be able to announce some decided additions to our knowledge on this subject. A sketch of the present situation of this remarkable branch of science may, therefore, interest the readers of the United Service Journal; the more so, as many of them, especially naval men, may have it in their power to promote our progress by their labours or their influence.

The popular opinion on this subject is, that the true theory of the tides was discovered by Sir Isaac Newton; that he showed this curious though familiar phenomenon to be a result of the attraction exerted by the moon upon the waters of the ocean and upon the earth itself; and that in this way the course of the tides, like the motions of all the bodies of the solar system, was shown to result from one great and pervading law—the universal, mutual attraction of matter. And so far the popular opinion is right; but there is a difference to be noticed with regard to what Newton and the Newtonian philosophy have done in reference to this subject, and to the other consequences of the law of universal gravitation. With regard to the motions of the earth, the moon, and the planets, those motions are not only accounted for, but all the circumstances and quantities of the motions are fully explained—so fully explained that they can be exactly calculated beforehand; and predictions of the future places of all the heavenly bodies can be delivered for any future period, however distant, which predictions are always verified with an accuracy truly remarkable. The power of calculation and prediction which we thus obtain is that which sets the seal of certainty and reality upon the theory, and makes it impossible for any intelligent and unprejudiced person who examines it, not to be entirely convinced of its truth.

Now, with respect to the tides, the case is hitherto very different from this. The tides are *explained* by the theory of gravitation: that is, it can be shown that a motion of the sea of that kind, governed mainly by the moon, would take place. But neither Newton, nor the Newtonians, nor any modern philosophers, have yet explained the amount and course of the tides, at any one place; nor can they calculate beforehand the time at which the tide will take place, and the height to which it will rise, with any pretensions to accuracy. A person, therefore, who should deny the doctrine of universal gravitation, so far as its application to the explanation of the tides, could not be convinced or refuted, as he might be in other cases, by showing the exact accordance of the results of calculations founded on the theory, with measurements obtained by observation. If we take a record of the times and heights of high water for a long period, we are not in a condition to show that they are what they ought to be, the theory being true; whereas, with regard to the astronomical phe-

nomena which flow from gravitation, we can show this in the most complete and satisfactory manner.

It will probably occur to many of our readers that the effect of accidental circumstances upon the time of high water,—for instance, of wind and weather,—and of the form of the shore, when the tide has to enter harbours and rivers,—will account for a great difference between theory and observation, and indeed would lead us to expect such a difference. But difficulties of this kind may be got over almost entirely. If we observe the tides for a long period, the effect of the wind, upon the average, is very slight, or altogether disappears; and the obstacles and modifying causes which arise from the shore and bottom are the same every day; and therefore would not make the course of the tides irregular, though they may make the time and height different from what they would have been without such obstructions. These circumstances, therefore, do not relieve the theorist from the *onus* of showing that the course of the phenomena is in accordance with his assertions. The *mean* result of observations *ought* to agree with the calculated result of theory.

This responsibility, the Newtonian, if he is a fair and philosophical person, will not attempt to evade; but he will not be able to deny that the obligation has not yet been discharged: the agreement in *detail* of tide observations with the consequences of the moon's attraction, has never yet been shown. The present object, therefore, of the cultivators of this subject ought to be, to bring into view this agreement, that is, if there be an agreement; or, if not, to bring into view the disagreement of fact and theory, and to leave the theory to take the consequences in the best way it can. This, accordingly, is what some persons at present are endeavouring to do; and the collection of long series of exact tide observations, made at many various places, is one essential part of this undertaking, to which the readers of this Journal are invited to contribute.

But, in order to make this comparison, we must not only collect many and good observations, but we must also be able to trace the consequences of the theory, under the actual circumstances of the land and sea on the earth's surface; and this is by no means an easy matter. It is, indeed, so far from easy, that it does not appear possible to do it with great exactness at present: for, the form of the shores of the ocean is so complex and varied, that no calculation can apply to it; and the *depth* of the sea, which is an important element in the question, is absolutely unknown. And, even if we knew all these *data*, the mathematical calculation of the motions of fluids has not yet become so perfect and powerful a system, as to enable us to say what would be the result of the moon's attraction, combined with the earth's motion, on such a body of water; so that our comparison is hitherto defective at both ends: we want to compare calculation and observation, and we have not a sufficient command over either to do so.

We are not, however, yet liberated from our responsibility, as philosophers, of bringing theory and fact together. For though we cannot trace *exactly* the results of theory, we can obtain a general notion

of what nature they will be; and we ought to be able to say whether they are of this nature or not. For the purpose of illustrating this, I will point out one view of the tides in which this comparison would be extremely interesting, and might be made without much difficulty, by a combination of efforts of different persons,—I speak of the manner in which the tide is distributed over the surface of the ocean, and the manner in which it moves from one position to another. For this purpose I must refer to the theory, but in a way not too abtruse for general comprehension.

The moon attracts every part of the earth, and those parts the most which are the nearest to her. Thus, the water under the moon, and the centre of the earth, are both attracted by her; but the water is more attracted than the centre, and therefore has a tendency to go away from the centre; which, if the centre and the water were equally attracted, it would not have. The water will, therefore, rise under the moon and form a protuberance: its convexity will rise higher than it would do if the moon did not attract it.

As the water under the moon is nearer the moon than the centre is, and consequently is more attracted, so the water on the opposite side of the earth is further off, and less attracted than the centre; and therefore is left, as it were, by the centre, which it would not be if the water and the centre were equally attracted. There will, therefore, be a protuberance of the water on the side of the earth which is turned from the moon, of just the same kind as that which is under the moon. The magnitude of these protuberances, will depend upon the mass of the moon and its distance; the nearer the attracting body is to the earth, the greater is the *difference* of its attractive power on the centre and the near or opposite side of the earth. These protuberances would be under the moon and directly opposite to her, if the earth were at rest, and if the whole surface were water. Neither of these things is so, and we must consider what difference will arise from an alteration of these conditions.

The earth revolves on its axis and carries the water with it; and the effect of this will be, that the protuberance will no longer be under the moon; it will *lag behind* the moon, if we suppose the moon to revolve round the earth. But if we suppose the ocean to be regularly diffused over the globe, this lagging will be always the same. If a small island exist in such an ocean, the two protuberances, and the lower water between them, will all pass the island in one day, and thus make two high and two low waters at the island; and these high waters will follow the passage of the moon at an interval of time depending on what I have called the *lagging* of the protuberance which forms the high water; and these protuberances would reach from one pole of the earth to the other, and thus bring high water at the same time to all places on the protuberant line. If we suppose, for the sake of simplicity, that the moon is always in the equator, the tide might be considered as a long wave, reaching from pole to pole, and moving round the earth, following the moon steadily and perpetually, and always at the same angular interval.

But it is very clear, that when we suppose the surface of the ocean

to be interrupted by great continents, like those of the Old and the New World, this sort of motion of the waters cannot go on. If we suppose such a tide-wave as I have spoken of to travel across the Pacific, when it reaches the shores of Asia and Australia it must be utterly broken and dispersed among the large islands of that part of the globe, and its progress westward as one wave altogether interrupted. The Atlantic will not receive its tides by such a wave coming into it from the east; and those tides, and the tides of the whole of this part of the world, must take place in some other way.

Now in what way will the tides, considered on this large scale, take place on the earth, occupied as it really is, with land and sea? We may form some notion of the result, by observing the way in which the long swell of the sea travels into a small creek. The large wave extends across the creek, and the part which fills the opening breaks off and travels separately up the creek. In the same manner we may still imagine a tide-wave moving round the earth from the east to the west in the Southern Ocean (for there is there a complete circuit of water;) and we may conceive that this wave turns northward and then travels into the Indian seas, and that another part of it moves northward up the Atlantic, and after running the profile of its swell along the coast of Africa on one side, and of America on the other, brings the tides to our own shores.

The tide in the Atlantic will not, it may be said, depend entirely on the tide in the Southern Ocean, as we have supposed; for the moon would produce a tide in the Atlantic, even if there were no Southern Ocean. This is quite true; but the way in which the tide moves from one place to another will still be in the nature of the motion of a wave, as it was seen to be in the above explanation.

From this being understood and conceded, a very curious and important undertaking is, *to trace the motion of this wave along the various coasts af the ocean, by actually observing at what time, on a given day or days, it is at each place;* that is, in short, by observing the moment of high water at such places. This is what I have above referred to as a possible and interesting way of comparing the observation of the tides with theoretical views; and this is what I have tried and am now trying to induce several persons to assist in doing.

The line which the ridge of the tide-wave occupies at any moment, I have called a *cotidal line*, intending by that term to suggest its nature, namely, that it is the line drawn through all places having high water at the same instant. This line occupies a different position every hour, and a series of cotidal lines drawn on the surface of the globe for each hour of a given day (the day of new or full moon for instance) would exhibit the motion of the wave, just as in a plan of a battle, the successive places of the same battalion marked on the plan show the movements of the body during the engagement.

Some of the information which is required to enable us to cover the whole surface of the ocean with cotidal lines, has been brought together already; and though it is a mere scrap of that which we might wish, and but a small fraction of that which we hope before long to

attain, it has led already to some curious conclusions. We will take two or three by way of specimen.

It appears, for instance, that the wave, the ridge of which is marked by the cotidal lines, does enter into the Atlantic from the south, and throws itself across that ocean, so as to extend from Brazil to the Gold Coast of Africa, bringing the tide to both at nearly the same time. This tide-wave then travels northwards, is much interrupted and disturbed about the Madeira and Cape Verd Islands, and, after washing the shores of Spain, Portugal and France, reaches the British Isles.

The general, or, as we may say, *natural* direction in which the tide-wave travels is from east to west, following the apparent daily motion of the moon. But in consequence of the position of the shores of Africa and America, the direction of this wave changes so, that its progress is *north*, as we have already seen. When it reaches the chops of the Channel, the tide-wave separates, one branch turns again and takes its way *eastward* up the Channel, thus moving opposite to its original direction. This is the branch which brings the tides to all points of the south coast of England as far as Dover, and, as it would seem, through the Straits of Dover to the North Foreland.

Another branch of the same tide travels along the west coast of Ireland and Scotland, and does not bend eastward till it reaches the Shetlands. But when it has thus turned the north point of Scotland, it not only turns to the east, but it afterwards turns to the south, and then travelling downwards, brings the tide to the whole of the east coast of England, as far as the mouth of the Thames. On reaching this opening, the tide again turns *westward*, and thus comes to London, after going through an entire circle in the way of change of direction.

The general direction of the motion of the tide-wave being from east to west, we might expect that, of all places in the world the most likely one for this direction to prevail in, would be the sea to the southward of Cape Horn, where there is an uninterrupted girdle of water round the earth. Yet it appears to be quite certain, from the observations of Captain King, (see his Sailing Directions,) that the tide is later and later as we take points more and more easterly on the south coast of Terra del Fuego; that is, the tide-wave in this part moves from west to east. It may easily turn out that this apparent anomaly prevails only near the shore, and that further out at sea the tide-wave moves in its *proper* direction; but the curious fact just mentioned shows how much caution, and how extended a collection of observations, are requisite, in order that we may draw our cotidal lines with any degree of accuracy.

There is one general rule which appears to hold respecting the positions of the cotidal lines, so far as they have yet been drawn. As we go out of the wide ocean into the narrower seas, these lines are more and more crowded; that is, the motion of the tide-wave is more and more slow. Thus in the Atlantic the velocity of the tide-wave is 600 or 700 miles an hour; in the Indian seas it is probably not a quarter of this. On the south coast of England the tide which

is at the Lizard at half-past four, is at Dover at fifty minutes past ten. This gives six hours and a quarter, nearly, for the tide to travel from the Lizard to Dover, a distance of about 300 miles; or a velocity of fifty miles an hour. *Cœteris paribus*, the velocity is least in shallow water and contracted channels.

The reader may probably be startled at the mention of such a velocity as 700 miles an hour, or twelve miles in a minute. But he must recollect that this is not the velocity of the *water*, but of the *waves*—not the rate at which the *substance*, but that at which the *form* is transferred. An undulation may run rapidly along, while the undulating substance does not run on at all; as may be seen in the waves which run along a field of corn on a gusty day, or the undulation along a stretched chain of rope. The *water* which makes the tide at Dover is not *that water* which made the tide at the Land's End six hours before, though the *elevation of the water* has been in that time transferred in a regular manner past every intermediate point of the coast. The rate at which the wave travels is no more identical with the rate at which the water moves, than the rate at which intelligence is conveyed by a line of telegraphs is identical with the rate at which the arms of the telegraphs move.

I may hereafter return to this subject; for the present I fear I may have wearied my readers.

[TO BE CONTINUED.]

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MARCH, 1834.

With Remarks and Exemplifications, by the Editor.

1. For a *Vegetable Dentrifice;* Elijah H. Reed, Clarksville, Habersham county, Georgia, March 1.

We have presented to our readers many patents for things impossible to be done, and many, the specifications of which were obscure and inadequate, but we have now one of an entirely new genus, a perfect nondescript. There is no failure in an attempt to describe the thing, it is true, because no such attempt is made. All that we are informed about the composition of this Dentrifice is, that it "is prepared from a marine plant, by repeated calcination and ablution, by which the ligneous parts of the vegetable are rendered fine, and the excess of alkali removed, after which it is triturated to an impalpable powder." If the patentee, or his attorney, had read the patent law, he would have found that he was bound to give the "process of compounding the same, in such full, clear and exact terms, as to distinguish the same from all other things before known, and to enable any person skilled in the art or science, of which it is a branch, or with which it is most nearly connected, to make, compound, and use the same." All this the law requires to be done "before he can receive a patent." The grant in the present case ought to have been refused, as the conditions have not been complied with, and the instrument is consequently nugatory. It is about as valuable as cer-

tain deeds for tracts of land, in the township of *Luna*, which some speculators in the western part of New York, disposed of to persons who thought the plots very pretty upon paper.

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2. For constructing *Cisterns for holding Water, &c.*; Nathaniel Fortin and William Van Vleck, Sullivan, Madison county, New York, March 1.

What is called a *pattern curve*, which is like a tub without a bottom, is to be formed of the size of the intended reservoir; an excavation large enough to receive this pattern curve, and to allow of a due thickness for the intended wall, is then made, and the bottom of it covered with gravel, stones, &c. mixed with hydraulic lime. Upon this the curve is placed, and the space between it and the earth, is filled with like materials, and when dry, the staves, &c. which formed the curve, are to be removed. The claim is to, "first, the pattern curve, around which to construct the cistern, reservoir, or wall; and secondly, compounding the hydraulic cement with substances of any kind, and thus forming a permanent wall by means of the pattern curve."

We refer to the patent of G. Tibbetts, for our notice of a very similar contrivance, so similar, that so far as principles are concerned, we should denominate them identical. Patentees, however, are rarely aware that alterations in form or proportions, which still leave a thing essentially the same in its mode of action, are not protected by the patent law, such alterations being mere colourable pretexts, which, were they not resisted, would destroy its whole intention.

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3. For a *Loom for Weaving Coverlids, Carpets, and all kinds of Fancy Work;* Emanuel Meily, jr., John Mellinger, and Samuel Mellinger, Lebanon, Lebanon county, Pennsylvania, March 1.

In this loom there is some simplification of the arrangement of those parts by which the pattern is produced, although the general principle of such looms remains unchanged. The claims made refer to figures on the drawing, and do not admit of a description that would be understood by one not perfectly conversant with such machinery.

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4. For an agricultural instrument called an *Agricultural Pulverizer*; B. F. Stickney, Vistula, Monroe county, Michigan Territory, March 1.

There is a striking resemblance between this machine and that patented by Mr. Jas. D. Woodside, on the 28th of July, 1832, the main difference being in making the part which is to pulverize the ground, in the form of cultivator teeth, and allowing them to fall back by means of a hinge joint close to the roller, whilst in Mr. Woodside's machine they are permanent teeth, or spikes. The roller around which the cutters, or hoes, are fixed, receives its motion by gearing from wheels which roll upon the ground, and there is a

lever to raise or depress the roller, as in the former machine. It is also proposed to place spikes or pins on the faces of the wheels which run upon the ground, should the friction not be sufficient to drive the roller with its cutters. There is no claim made.

We have alluded to Mr. Woodside's patent, but find that our notice of it was accidentally omitted in its proper place; but as this instrument is now coming into use, we design, at an early day, to place the specification of it, with a cut, before our readers.

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5. For a *Thrashing Machine;* Daniel Davis and James Holmes, Fredericksburg, Spottsylvania county, Virginia, March 3.

Although there are seven different things distinctly pointed out, and claimed as improvements, the general construction of this thrashing machine is the same with those in most common use, and we shall not, therefore, detain the reader by pointing out what we consider as minute variations, although the patentees may esteem them of much importance.

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6. For a *Machine for making Wrought Nails, Spikes, Tacks, Horse Shoes, Rivets, Horse Shoe Nails, Screw Bolts, &c.;* William and Thomas Schuebly, Hagerstown, Washington county, Maryland, March 3.

We had not read beyond the title of this patent before being convinced that we were about to meet with an old acquaintance, one, however, who, we are sorry to say, has always failed in the business which he has undertaken to perform, whenever he has attempted to make nails, horse shoes, and other articles of wrought iron. He has had numerous partners, but has always lightened their purses, or involved them in debt, and we are well assured that if the gentlemen who have now taken him by the hand, should persevere in their patronage, they will wish that they had cut the acquaintance at an early day. What the patentee claims to be able to do is "the making nails, spikes, tacks, horse shoes, rivets, horse shoe nails, screw bolts, &c. &c. &c. by two cylinders with one half impression of each article to be made upon each, corresponding precisely with each, except the horse shoe, which varies, as the two sides are not alike, one side having a groove for nail holes, the other plain."

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7. For *Colouring Lamp Oil of different tints,* Ezra Bourne, city of New York, March 4.

To render the oil red, alkanet root is to be put into it, and to remain until the colour is sufficiently deep. For green, verdigris is to be used, grinding it, and allowing it to be rubbed up with a portion of oil; this may be poured into a cask, and the oil eventually strained. Cinnamon and cloves are to be used for a cinnamon colour, the colouring matter being extracted by a mixture of oil and spirits of turpentine. A deeper colour may be obtained by oil of pimento.

The foregoing contains the whole substance of the specification,

the modes of colouring not being claimed. From our brass lamps we could have supplied to the patentee a green colouring matter, which we have often thrown away; the colouring of oils by alkanet root, has been done thousands of times, and, for ourselves, we had rather use the cloves and cinnamon for other purposes. We can assure the patentee, that an easy mode of depriving oil of all colour, would be an invention much more likely to please the public than that for communicating colour thereto.

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8. For a *Machine for making Wrought Nails, Brads and Rivets;* William Slater, Clarksville, Clinton county, Ohio, March 5.

This machine is intended to form nails, &c. by means of rollers, and although we are convinced that it will not fulfil the expectations of the patentee, and know that there is no novelty in its general principle, there still is merit in its details. It is not proposed to form the heads of the nails by the operation of rolling, there being a separate movement for that purpose, consisting of a heading die, brought up by a crank motion, whilst the nail is gripped between the rollers. There is no claim made to any part of the machinery, but, as it is not likely to answer in practice, this omission is a point of little importance; were it otherwise it would be necessary to correct the evil by a surrender of the patent, and a reissue of it under a new specification.

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9. For a mode of *Ventilating Vessels;* Russel Jarvis, Boston, Massachusetts, March 5.

We are informed that "this invention or improvement consists in expelling or drawing foul air, humidity, and every kind of noxious vapour, from the vessel, and introducing, or injecting, at the same time, fresh air into the same vessel, without introducing water," &c. &c. The means proposed is the employment of condensing and exhausting pumps, to draw the foul air from the vessel, and introduce that which is fresh. It is proposed to place tubes leading down the masts into the hold, the masts being grooved to receive them, to prevent their interfering with its rotundity. Nothing peculiar is claimed in the construction of the pumps, or in the kind of machinery by which they are to be worked, the plans given being considered as mere exemplifications of the general principle.

The patentee expressly says, "I do not claim as a new invention, the pumps above mentioned, nor the engine above described. What I claim as new, and as my own invention, is the application of pipes, pumps, and wheel work, or other moving power, as above described. Or of pipes alone, fixtures in the vessel, as above described, to the ventilation of every kind of vessels."

He does not appear to be aware of what has already been done and published, upon the subject, or he would have known that his claim was essentially defective. As to that part in which he proposes merely to fix tubes through which foul air may escape, and others through which fresh air may enter, we view it as so entirely inade-

quate, and so inferior to the ordinary wind sails, that we shall not attempt to discuss its merits. With respect to the pumps for blowing and exhausting, we might refer to many other sources of information, but under the article VENTILATION, in Rees' Cyclopedia, enough will be found to convince any one that what was done upon the subject by Dr. Hales, as far back as the year 1741, would throw the present plan into the shade. There the whole arrangement is clearly and distinctly shown, whilst the specification before us leaves the thing claimed uncertain and obscure, in most of its points, and would enable the patentee, should he see one of Dr. Hales' ventilators at work, to say, "that is an invasion of my right."

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10. For *Saw Mill Dogs;* Martin Rich, Ithaca, Tomkins county, New York, March 6.

Several patents were obtained in the course of the year 1830, for dogs for saw mills, two of which were granted to the same individual to whom the foregoing was issued; these were dated Feb. 19th and April 13th of that year. In the present instance the manner of constructing the apparatus is described in a very general way, without designating what is relied upon to sustain the patent; and although there is sufficient difference between this and those formerly patented, still it was the duty of the patentee to point out this difference specifically. The main variation is in the use of a right and left handed screw, crossing the head block, instead of the sliding bar used to carry the bales, in those referred to.

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11. For a *Machine for Weighing Heavy Bodies;* Thaddeus and Erastus Fairbanks, St. Johnsbury, Caledonia county, Vermont. First patented June 13th, 1831. Patent surrendered and reissued upon an amended specification, March 6.

Having originally noticed this patent, we shall now insert the claim only, in the new specification.

"What we claim as new, and for which we ask a patent, is the knife edge hinges constructed in the manner and upon the principle hereinbefore set forth, and the employment of the pieces denominated rockers, with one lever attached to each, these being connected together at a point equidistant from their axes."

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12. For improvements in the *Machine for Weighing Heavy Bodies;* Thaddeus and Erastus Fairbanks, St. Johnsbury, Caledonia county, Vermont. First patented February 21st, 1832. Patent surrendered, and reissued upon an amended specification, March 6.

Both this and the specification of the last named patent, refer throughout to the drawings which accompany them, and which are perfectly descriptive. The claim, as made in the present instance, is in the following words: "What we claim as an improvement upon the weighing machine, as formerly patented by us, is the manner of

arranging and connecting together the levers attached to the rockers. We also claim the variation in the manner of arranging the rockers and the hinges, so as to place the former under the platform, as shown in the drawing; and likewise the mode of obtaining a vibratory motion in the supporting power by means of the standards (E, E,) which are used instead of the fulcrum, or prop; not intending, however, by these claims, to confine ourselves to the exact form and manner of constructing the various parts of our machine, as herein exemplified, but to vary the same as we may find convenient, in any way which produces similar effects, upon the same principles or modes of action.

We shall not here institute a comparison between these and other platform balances, but will observe, that after a fair opportunity of testing the weighing machines of Messrs. Fairbanks, we should not desire, for ordinary weighing, an instrument of greater accuracy. We have had one in our possession, calculated to weigh several hundred pounds, which, when unloaded, would turn by the weight of a small visiting card, and when fully loaded, indicated quarters of ounces.

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13. For an improvement in *Common Skates;* Nathaniel C. Sanford, Meriden, New Haven county, Connecticut, March 7.

The improvement claimed is in the manner of grooving the blade of the skate "with more than one channel on the bottom, and so as to have a flat or convex bearing on the bottom, between the two angular corners of the bottom of the instrument." All the residue of the instrument may be formed in the usual way. The annexed forms exhibit sections of the blade grooved in the manner proposed.

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14. For an improvement in the *Roller Gin for Separating the Seeds from Cotton;* William Whittemore, jr. West Cambridge, Middlesex county, Massachusetts, March 7.

The specification of this patent is one of considerable length, and refers throughout to the drawings. As the machine is one in which but few of our readers will feel an interest, we shall not attempt to epitomise the description, nor shall we give the claim, as this, without the drawings, would afford but little insight into the matter.

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15. For a mode of *Preventing the Forgery of Checks;* John D. Pope, Baltimore, Maryland, March 8.

This is one of those schemes which will never go into operation, as there are to be scales of check numbers for the use of each individual, and also to be lodged in the bank, for the purpose of indicating the number of checks which have been issued. To designate their amount, sets of steel types are to be made, with cutting edges, and with these, by means of a proper press, the numbers are to be cut out from the paper. In this plan there is no novelty; a proposition to

patent it was made some years since, and discouraged by the Editor, as one of those schemes which would not pay the cost.

16. For a new *Mode of Constructing Steam-boats and other Vessels;* Henry Burden, city of Troy, Rensselaer county, New York, March 8.

(See specification.)

17. For *Metallic Rims for Vault Lights;* Edward Rockwell, city of New York, March 8.

This patent, it appears, is taken for preparing a frame of cast iron to receive the lights of plano-convex, or other formed glass. "The invention claimed is the use of ornamental or plain cast metal frames, or chases, to protect *semi-plano* lights for vessels' decks, vaults under pavements, and other subterranean apartments; the glass being perfectly well protected, and the cast iron frame highly ornamental, and made of any size, shape, and of any metal, and to be used for all purposes."

Perhaps a patent of this kind may deprive all but the patentee of a right to put a glass light into a metal rim, but we do not, at present, believe that it will. The kind of glass mentioned, semi-plano, is a form with which we are not acquainted.

18. For an improvement in the *Steam Engine;* John B. Emerson, city of New York, March 8.

(See Specification.)

19. For a mode of *Manufacturing Boots, Shoes, Socks, &c. &c.;* William Atkinson, Tewksbury, Middlesex county, Massachusetts, March 8.

(See specification.)

20. For an improvement in the mode of *Constructing Chimneys, Fire Places, Grates and Stoves, for the burning of Coal;* Ormsby M. Mitchel, Cincinnati, Hamilton county, Ohio, March 8.

To get rid of the dust in burning coal, what the patentee calls a "dust flue," is to be constructed, leading from the ash pit under the grate, behind it, up to the smoke flue, at or near the throat of the chimney. There may be a cover, or stopper, to the hole leading into the dust flue, to be used when required. Had the patentee visited the region where anthracite is burnt in grates, he would hardly have applied for a patent for a contrivance which is in almost universal operation.

The other part of the invention consists in making the lower bar of the grate hollow, or rather in the form of a trough, with a cover to keep out the ashes. This is to contain water, the evaporation of which is to prevent too great a degree of dryness in the air of the room. In close stoves, a contrivance for evaporation is undoubtedly very beneficial, and, indeed, in well closed rooms, where anthracite

fires are kept, there is usually too little aqueous vapour. The grates in question, however, are intended for bituminous coal, and we have never heard of, or felt, the same cause of complaint from this, as from anthracite. The contrivance for supplying moisture, in the grate before us, does not appear to be very well imagined, and, assuredly, the vapour which is generated, will, nearly the whole of it, pass up the chimney with the draft.

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21. For a *Machine for Fluting Wash Boards;* Edward Loud, Worcester county, Massachusetts, March 8.

A wheel with cutters upon its periphery, is to be made to revolve with rapidity, and the article to be fluted, placed upon a suitable bench, with a guide, is passed over the cutters.

We do not know that such a machine has been used for fluting wash boards, but we deem this of little importance, as there is no novelty in its construction; such machines, for cutting mouldings, and other purposes, have received repeated notice from us.

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22. For an improved *Cooking Stove;* Elisha D. Payne, city of New York, March 8.

(See specification.)

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23. For a *Chandelier, or Hanging Lamp;* William Lawrence, Meriden, New Haven county, Connecticut. First patented March 23, 1831. Patent surrendered, and reissued upon an amended specification, March 10.

This lamp was described in vol. 8, p. 18, and the claim quoted from the specification; this latter is considerably modified in the new instrument, and is in the following words: "I do not claim as my invention, the tubes for the wicks, nor the glass tube, nor the opening through the body of the lamp, simply; but what I do claim as my invention and improvement is the following combination, viz: the lamp with an opening through the body thereof, in such form, in relation to the wicks, as not materially to intercept the radiation of light, combined with the tubes for the wicks, and with a glass tube placed at a proper distance above the body of such a lamp, so as to cause such a current of air on each side of the wick, as to produce a white, clear and vivid light, and effect a combustion of the smoke."

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24. For a *Mill for Cracking or Grinding Corn or other Grain;* Benjamin Hinkley, Fayette, Kennebeck county, Maine, March 10.

The corn to be broken is put into a hopper having a longitudinal slot in the bottom of it, against which revolves a steel roller, about two and a half inches in diameter, and twelve inches long; the face of this roller is cut like a rasp or grater. A flat plate of wrought iron stands along the cylinder, their distance apart being adjusted by screws; and between these the grain descends when the roller is turned. To give the proper motion there is a cog wheel, pinion, and fly wheel,

fixed in the usual manner. The claim is to "the particular form of the solid steel cylinder shaft, and the indented, or rasping, surface made upon the grinding part of the same; and the flat surface of iron, and the manner of screwing and guaging the same to and from the cylinder."

The similarity between this machine and that of Webber Furbish, noticed vol. 13, p. 403, will be apparent to any one.

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25. For improvements in *Tanning;* Mark W. Jenkins, Baltimore, Maryland, March 10.

The improvements here patented are made upon the apparatus of Mr. Jacob Dawes. This, it is observed, consists of a lath, or piece of timber, across each end of the vat, near the top, having hooks in them upon which the skins are hung, so as to extend vertically from one end of the vat to the other. The improvement made by the present patentee consists of two horizontal movable frames, the outer one resting on two pins in the vat, and the inner one on pins in the outer, like the gimbals of a compass frame. On the end pieces of this latter, the hooks are placed, and the skins hung upon them.

To raise the frames, and move the whole if desired, from one vat to another, a car is made with two wheels, to span the vats, with a windlass, and suitable appendages.

The patentee says, "I can use either one frame or the two as improvements upon Mr. Dawes' manner of arranging and handling the skins. The application of the car, with its appendages, I believe to be altogether my own." If the patentee has not the permission of Mr. Dawes, he is mistaken in the idea of his right to use his plan because he has improved it. (See Stem and Wireman's patent, p. 109, August No.)

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26. For a *Vertical Wool Spinner;* William Sykes and George M. Conradt, Fredericktown, Frederick county, Maryland, March 10.

The novelty claimed in this machine consists in the mode of drawing the thread. The slubbing is put on to a roller in the usual way, and is conducted down to the spindles on the lower part of the machine; in descending, it passes between two segment rollers, that is, rollers which have opposite sides flattened, so as to remove about half of their touching surface; the roving in descending is embraced, alternately, between the two cylindrical parts. Similar rollers are placed a few inches below these, embracing the thread at the time it is free in the upper rollers; "and thus the operation of a continued drawing is performed, and at the same time the flyers give it the requisite twist. If hard twisted yarn is required, the pairs of rollers are placed nearer together; for loose yarn, further apart." The claim is confined to this part of the structure.

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27. For a *Machine for Cutting Shingles;* George Knode, Blacksburg, Montgomery county, Virginia, March 10.

The mode of making shingles here patented, although it is by

straight sawing, appears to be very roundabout. Boards are first to be sawed of a suitable width, and thick enough for two shingles, heel and point. These boards are then to be cut of shingle length, and confined between the sides of a frame made of scantling, and notched out so that when the boards are received between them, a saw-mill saw, passed straight along between the scantling, will cut each board, widthwise diagonally, and form it into two shingles. The mode of making the frame, of pressing the boards between the sides, and of confining them edgewise whilst being sawed, is described; but as there are many shingle machines that will make ten for its one, we think best to say no more about it.

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28. For an improvement in *Mill Spindles;* Frederick Fredly, Logan, Centre county, Pennsylvania, March 10.

On the spindle, below the bed stone, there is to be a cylindrical collar, turned perfectly true; three, or any other number, of flat friction wheels, bear against this collar, by their peripheries; these wheels may be about eighteen inches in diameter, and are to have steel axles, running in oil cups. An iron plate, with a suitable flanch, is to be so placed upon the bed stone, as to prevent grain from falling through; and balls, it is said, are placed around a cavity in the bottom of the spindle, to prevent its wearing. The description of this part is very obscure; the claim is to the friction wheels placed round the spindle, and the collar and flanch upon the plate to prevent the grain from passing through the eye of the bed. Nothing is here said about the balls.

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29. For a *Machine for Cleaning Clover Seed;* Samuel Raub, jr., Wilkesbarre, Luzerne county, Pennsylvania, March 10.

A cylinder and concave, adapted to each other, are to be covered with punched sheet iron, and "what is claimed as *new*, is the manner of constructing the cylinder and bed piece, in preparing the sheet iron, punched and made rough, as described in the above specification, and in the adaptation of the machine to the thrashing and cleaning of clover seed." Not quite new, we apprehend.

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30. For an apparatus for *Curing Smokey Chimneys;* Henry Pollock, Baltimore, Maryland, March 11.

The oft told tale of cold air admitted from without, under the hearth, and passing into a space behind the metal back of the fireplace, there to be heated, and thence admitted into the room, is here again repeated, without the variations. When the smoking is caused by currents blowing down, a quadrangular sheet iron cap is placed upon the top of the chimney; the top of the cap may be arched, and the smoke escape at each side, whilst two other openings are left below these, "made in the shape of the mouth piece of an organ pipe, and at these the smoke escapes when the current blows down;" or, perhaps, it might be best to say, that through these it is intended that the smoke should escape, in the case of a downward current.

31. For a *Hoisting Machine, for raising Heavy Bodies;* John Drummond, city of New York, March 11.

This hoisting machine consists of a combination of wheels and pinions, operating upon the same principle with many similar machines. The patentee has not pointed out those particular features in it by which he considers it as distinguished from other machines, but has merely described its construction, and claimed "the arrangement and adaptation of the several parts of the machine, so as to produce the hoisting machine before described."

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32. For a *Machine for Cutting and Trimming the Edges of Books and Paper;* Joseph Bateman, Harvard, Worcester county, Massachusetts, March 11.

The machine here patented is clearly described in the specification, well represented in the drawing, and has the merit of differing essentially from those previously patented for the same object. The body of the machine consists of three parallel bars, which may be eight feet long, and six inches square, placed horizontally, one above the other, and supported at suitable distances apart by end cheeks, bolts, &c. The lower bar forms the bed upon which the paper to be cut is placed; the middle bar is the follower, which is forced down by screws, and presses the paper, or books, to be cut, and the upper bar serves for the pressing screws to work in.

A sliding bar in front of the press, has in it eight knives, placed a foot apart; they are in form like the ordinary book binder's cutting knife, and are fixed in the sliding bar in such a way as to admit of their being properly adjusted, and the bar itself is so confined that whilst it slides freely, it can not swerve from its proper direction. A fly wheel and crank, connected to the sliding bar by a reach or pitman, gives to it the proper vibrating motion. The different adjustments we do not attempt to give, as these would require the whole specification. The claim is to "the simultaneous use of so many knives, brought to bear upon the books or paper to be cut, or trimmed, by turning the balance wheel, and the consequent operation of the weights, shafts, screws, and springs, above described."

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33. For an improvement in the construction of *Wheels for Carriages of all kinds;* Henry Beebe, Haverstraw, Rockland county, New York, March 12.

This wheel is to be made with a rim and spokes of wrought iron, and a hub of cast iron. The rim for a four feet six wheel, it is proposed to make of iron five-sixteenths thick, and one and three-eighths wide. After this is formed into a hoop, holes are to be bored in it to correspond with the number and size of the spokes; these latter are tapped, and have nuts on their outer ends, the screw slides freely within the holes in the rim, which are smooth. When the hub is to be cast, it is moulded in such a way that the bore to receive the axle, may have an enlarged opening in the centre, for the sake of lightness, and to contain oil, &c. The spokes, surrounded by the rim, are laid in the flask, so that the cast metal shall embrace

their inner ends. When cast, the wheel is placed upon an axle, and turned round to try if the rim is true; to make it so, the nuts are tightened up against it, and when true, the projecting ends of the spokes are removed, and heated tire put on. The claim is to "the whole of the machine, or wheel, above described, when taken together, and the mode and manner of constructing the same, particularly the principle of constructing the hub upon the iron or steel spokes. But no claim is made for the mode of making the hub, the spoke, the rim, or the tire, or any of the parts of the machine, or wheel, taken separately." The hubs of wheels have often been cast upon wrought iron spokes; it would seem, therefore, that the *particular principle* claimed, is not new. We doubt the goodness of the whole wheel, and particularly the durability of the connexion between the cast iron hub and wrought iron spokes.

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34. For *Manufacturing Tea Pots, and other Vessels of Brittania Ware;* William W. Crossman, Taunton, Bristol county, Massachusetts, March 12.

(See specification.)

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35. For a *Machine for Cutting Straw and Hay;* Joseph S. Bishop, Wayne, Kennebec county, Maine, March 12.

The material to be cut is placed upon a feeding apron, and carried between two rollers, the upper one of which is borne down by spiral springs. Two knives, revolving like the beaters of a cylinder thrashing machine, cut the straw, &c. as it passes over a bar of iron which they nearly touch. The speed of the feeding apron may be adjusted so as to determine the length of the straw when cut. Although there is little or no novelty either in the individual parts, or in their arrangement, the claims are very comprehensive, consisting of " the form and arrangement of the knives, also the construction of the wheels to govern the hay or straw, which I cut from one quarter of an inch to three inches, or more; and also all the arrangement of the above described machine, and also *any power that may be applied.*" After this, what man will be willing to turn his machine?

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36. For a *Smut Mill;* Parker Wing, of Verona, Oneida county, and Orlando Root, of Amsterdam, Montgomery county, New York, March 12.

This machine, besides scouring grain, is proposed to be applied to hulling, and to the grinding of bark. There are to be two cast iron round plates, placed like the stones of a mill, the lower plate being the runner, and the upper resting upon a suitable frame; this latter has an eye, surmounted by a hopper in its centre, and the spindle of the runner rests upon a bridge tree at its lower end. The faces of the plates are to be furrowed in the manner of the dress of a mill stone, and there is to be a curb, with holes to let out the dust, and a proper opening to discharge the grain. "What the patentees claim as original, is the dress of the plates, from eight to thirty-two quarters, with the draft of the same from the eye to the skirt of the plate; the

curb, the flanch on the running plate, the ring with its flanch, and the position in which they are placed to secure the grain; the mode of running the under plate, and the application of the machine to the purpose of grinding bark." If all these claims, severally and collectively, can be sustained, the patentees will be very fortunate.

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37. For *Generating Warm Air for Heating Buildings;* Joseph L. Dutton, Philadelphia, March 13.

Into the furnace for heating churches and other buildings, a cold air tube is to be introduced from without; it is to pass up through the centre of the furnace, its immediate contact with the fuel being prevented by surrounding it with grate bars, nearly in contact with it, which, by means of a handle, may be so moved as to stir the fire. Where the air tube rises above the fire it is enlarged, and surrounded by a sheet iron cover, tubes being so inserted as to increase the heating surface. The claim is to "the introduction of an interior column of cold air, and its application either to stoves, furnaces, &c. of the usual construction, or to any other apparatus for obtaining heat, together with the movable upright grate, or bars, for shaking the ashes."

The passing of air tubes through a fire, for the purpose of obtaining heat, is no new device. Dr. Nott's vibrating grate appears to have been pregnant with similar expedients, and its progeny is numerous.

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38. For a *Horse Power;* Jehial F. Axtell, Geneva, Ontario county, New York, March 13.

"The improvement claimed is in making the horse power of iron instead of wood or other materials, and for the manner in which the same is put together."—As there are many horse powers made of iron, this claim is good for nothing; and even had such not been the case, the making it of iron, without any novelty in its principle, would not be found to be that kind of improvement which the law requires; as to the manner of putting it together, there is nothing specified as new or peculiar, and nothing with which every workman is not familiar.

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39. For a *Machine for Shelling Corn;* Calvin Page, Sandbornton, Strafford county, New Hampshire, March 13.

(See specification.)

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40. For a machine for *Slicing Apples,* preparatory to drying; Daniel Davis, 2nd, Stafford, Tolland county, Connecticut, March 14.

Nine, or any other number, of knives, or cutters, are placed round the periphery of the segment of a small wheel, or rather half wheel, which is fixed against a vertical plank, and, by means of a small handle, turns upon a centre pin. The knives are not in the same plane, each of them being placed about one-sixth of an inch in advance of the one which preceded it. A recess, or hole, is cut in the vertical

plank, to receive the apple, in such a position that the first knife will cut a thin slice from it, the others continuing the operation; a vertical pin passes into the eye of the apple and a wire above, having a crank at its upper, and four prongs at its lower end, enters the other end of the apple, the wire sliding up and down in staples, to remove and replace it. When an apple is fixed, the knives are brought round, so as to slice its projecting side; the crank is then turned about one-third round, and the operation repeated, a third cutting completing it.

The whole arrangement being considered as new, no claim is made.

41. For a machine for *Cutting Straw, Hay, &c.;* Ethel H. Porter, Lincolnboro', Lincoln county, North Carolina, March 14.

The cutting in this machine is effected by two knives upon a cast iron wheel, in a manner well known. The feeding trough, and feeding rollers, are also similar to those in many other machines. The claim is to "the construction of the frame and the feeding," in neither of which do we see any thing upon which to found a claim, and if any thing there be, it was the duty of the patentee to point it out.

42. For a *Machine for Making Wrought Nails and Spikes;* William Osgood, and Ebenezer Hunt, city of Troy, Renselaer county, New York, March 14.

In this machine the nails are to be made from rolled or slit rods of the proper size for the body of the nail. The nail rod is to be put into the machine while hot, and the piece to form the nail is cut off, griped, pointed, and headed, at one operation. The patentees observe that the form of the machine may be so varied, that no description could comprehend all these variations, and that their claim is not therefore to the form, but to the modes of operation. The specification is carefully drawn up, and there is a good perspective representation of the machine, but still we think it defective in matters of detail, which can rarely be shown in a single perspective drawing. Those "modes of operation" upon which the patentees rely, are not at all set forth, but left to be inferred from the general description. Were it otherwise, we could not pretend, without adequate engravings, to present them to the reader, and shall not now make any attempt so to do.

43. For a *Metallic Frame Hat Block;* Norris S. Canfield, Wilton, Fairfield county, Connecticut, March 14.

The object of this improvement is to form a hat block which shall admit of a free access of the dying liquor, and of air, in the operation of dying. A cylinder of wood, two or three inches in diameter, and a little longer than the crown of the hat, is to have wire, or strips of copper, or other suitable metal, attached to it in such a way that they may form a round cage, or reel-like apparatus, with the cylinder in the centre. Upon this the hat is to be placed when submitted to the action of the dye stuff, this operation being performed in the usual way. "The principle of this improvement consists in the mode of

constructing a frame hat block of wire, or strips of copper, or other metal, fixed in the ends of the piece of wood, by the ends thereof, and in sufficient numbers to support the crown in shape."

On turning to p. 120, it will be seen that Mr. Richard Pike, of Wilton, obtained a patent for a hat block intended to effect the same purpose, and essentially the same in its construction. We are clearly of opinion that one of them interferes with the other.

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44. For an improvement in the *Construction of Ploughs;* David Staebler, Lancaster, Lancaster county, Pennsylvania, March 15.

This is a wheeled plough, having two wheels in front, and one in the rear of the mould-board and coulter. The latter part may be either double or single. The form given to the frame is such as to adapt it to the wheels and other parts. The claim is to "the mode of making the entire frame work, as well as the manner of applying and using the plough share, coulter and mould-board."

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45. For *Stoves for Burning Anthracite and other Coal;* Abraham D. Spoor, Coxsackie, Greene county, New York, March 15.

The number of patents this month exceeds ninety, and for the purpose of giving the whole, it is necessary, with most of them, to make our remarks more brief than usual; but, for certain reasons us thereunto moving, we wish to give a somewhat extended notice of this stove; we shall place this notice among the specifications, to which, therefore, we refer.

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46. For an improvement in the *Manufacture of Bridle Bits;* Henry Pierce, Sharon, Litchfield county, Connecticut, March 15.

These bridle bits are to be made by twisting wire together, so as to form the several parts.

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47. For a *Machine to Raise Bags of Grain or Flour, for Shouldering;* John Kinman, Hartley, Union county, Pennsylvania, March 15.

An upright post is to be fixed in the floor, its lower end being rounded, and passing into a socket to allow it to turn round. A sliding box, having a bottom or shelf, upon which to place the bag, and a back and sides to sustain it, slides up and down upon this post, by means of a socket or box, behind that which holds the bag. Upon the post there is a rack, into which a pall, or catch, falls, so as to hold the box at any height to which it is raised. A tackle, or other apparatus, may be used to raise the box and bag to a suitable height for shouldering, when, on removing the catch, the box will again slide down to the bottom of the post.

48. For a *Machine for Shaving and Jointing Shingles*; Samuel B. Chapman, city of Burlington, Burlington county, New Jersey, March 15.

The description of this machine, and the drawing which accompanies it, have not sufficed to furnish us with a clear idea of its particular construction. The shingles, it appears, are to be forced between two knives parallel to each other, in doing which they are passed between two pairs of rollers, of wood or iron, one pair of which appears to be intended to guide them to, and the other to receive them in the delivery from, the knives. The jointing is to be effected by means of planes, each carrying three irons; but how the shingle is to be held whilst acted upon, does not appear. There is not any thing pointed out as new, or a claim made to any part of the apparatus.

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49. For an *Apparatus for Lighting Lamps and Candles;* Edmund Hubbard, and William L. Cheney, Chester, Hampden county, Massachusetts, March 17.

This "lamplighter" is merely a cylindrical lamp of small diameter, fixed on one end of a wooden handle, or rod. The burner, with its wick, may be screwed on in the ordinary way. Although the talents of two persons have been taxed in the production of this article, we are unable to see in what respect it is better than the instrument ordinarily used for lighting street lamps. In many cases it will be less convenient than that, as it will not admit of being so readily applied to the wick of the lamp or candle which it is to light.

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50. For an apparatus for *Extricating Horses from Carriages;* O. R. Broyles, Anderson Court House, Pendleton District, South Carolina, March 17.

In this apparatus the windlasses to which the leathers of the swingletrees are attached, are made capable of revolving so as to present their reversed sides to the horses, and so constructed as the swingletrees will, in that case, be detached, and the horses liberated. They are ordinarily held in their places by two levers, connected together by a rope at their extreme ends, but according to the present mode, their connexion is destroyed, and the horses freed by pulling a line which passes from them to the carriage. The plan appears to be relied on as altogether new, no claim being made to any part of it. The particular arrangement described may probably be original, but there are others bearing some analogy to it, equally simple, and operating equally well, which have been introduced, but have never gone into extended use. The fact is, that whilst we laugh at the sailor who objects to a cork jacket, or other life-preserver, because he is apprehensive that it may invite the catastrophe against which it is to guard, most of us neglect those precautions that are intended to protect us against *possible* danger only.

51. For a *Substitute for Lamp Oil, denominated Carbonated Alcohol;* Samuel Casey, Lebanon, York county, Maine, March 17.

The patentee's recipe is, take one gallon of alcohol and one pint of spirits of turpentine, shake them together, and add half a pound of camphor.

On the 16th of October, 1830, Mr. Isaiah Jennings obtained a patent for a mixture of alcohol and spirits of turpentine, as a substitute for oil. An account of this patent may be found at p. 75, vol. vii. We consider the present as a manifest invasion of the rights of Mr. Jennings, notwithstanding the addition of the camphor. The late fatal accidents resulting from the use of such ingredients in lamps, will, however, probably put a final stop to the use of these mixtures, and we have no doubt that a court of law would now decide that they are not useful, within the meaning of the statute.

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52. For a *Self-sharpening Plough Share;* Richard B. Chenoweth, city of Baltimore, state of Maryland, March 17.

The improvement is said to consist in the form of the share, and the manner of fastening it to the mould-board; it is stated, that the same mode of fastening was claimed by the patentee in a former patent, but without a share which admitted of a reversed application; in the present instance the share embraces both the share and point in one, and is so made as to be capable of being reversed or turned over; when the wear produces the proper sharpening for reversing again. The share being properly fitted to the mould-board, one bolt in the middle secures it in its place. The patentee claims "the form of the share, as embracing both share and points, and susceptible of a reverse application, and self-sharpening by the reversion of such application; with the manner of fastening the share on the mould-board."

As this mode of fastening has been previously claimed, it is not a legal subject of claim in the present patent, and would certainly vitiate it. The self-sharpening, by reversing, has been claimed by more than one patentee, and cannot now be sustained abstractedly, although it might, possibly, stand as applied to a new and improved form of share.

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53. For a *Percussion Pistol Whip;* Joshua Shaw, city of Philadelphia, March 17.

A percussion pistol is to be contained in the handle of a riding whip, the construction of it not differing materially from some of the pistols or rifles contained in canes. The thong is fastened to the end of a ferrule that is attached to the whip handle by a bayonet lock, and is to be removed before firing. The percussion cap stands immediately behind the pistol, and the charge is ignited through its centre. The pistol is cocked by drawing back a rod, which passes through the centre of the handle, and has a small button projecting at its head; and the depression of a small knob at the side, effects the discharge. The separate parts are not claimed as new, but the

whole in their state of combination, with the variations of which they are susceptible.

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54. For a *Machine for Dressing Staves for Barrels;* Solomon Crumber, Hemlock township, Columbia county, Pennsylvania, March 18.

(See specification.)

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55. For a mode of *Constructing and Combining Bells for Horses;* Jason Barton, Cairo, Greene county, New York, March 18.

(See specification.)

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56. For making *Earthen Pipes for the Conveyance of Water;* Andrew Coffman, New Market, Shenandoah county, Virginia, March 18.

A mould is to be made in two pieces, and a core to form the tube. The thing has been done hundreds of times in similar and better ways; it is in vain, therefore, that the patentee claims "the construction of the moulds, and the application of the said pipes."

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57. For a machine for *Hulling and Cleaning Clover Seed;* David Rankin, Augusta county, Virginia, March 18.

(See specification.)

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58. For *Softening Dried Hides and Skins for Tanning;* Isaac Robinson, city of Baltimore, State of Maryland, March 18.

The process adopted by the patentee is said to offer numerous advantages, in the saving of time and labour, in the correcting the tendency to taint, and improving the quality and weight of the leather. For four hundred pounds of hides, after having soaked them in water twenty-four hours, prepare a vat with water enough to cover them, and into a separate vessel put the following ingredients:—twenty pounds of potash, a peck of slacked lime, a peck of common salt, four pounds of Glauber's salt, one pound of saltpetre, two pounds of muriatic acid. Dissolve them in water, and put two-thirds of the solution into the vat, and soak the skins in it for twenty-four hours; draw them out and put in the remaining composition; into this they are to be placed, and drawn daily, until sufficiently raised, which usually requires about four days. This liquor is to be used with succeeding packs of skins, allowing them to lie twenty-four hours in it, before increasing its strength.

The patentee has, no doubt, tried the mixture for which he has obtained a patent, and, it is to be presumed, has found it to produce the effects specified by him; but, if so, other mixtures may be made which will answer equally well without interfering with his right, which, from the nature of things, is limited to the compound as given by him. The mixture is so entirely empirical that, with some claim to chemical knowledge, we scarcely think that we could execute the

task of tracing the action of the various ingredients upon each other; we, however, could substitute others, with very different names, which would produce a result substantially the same with that of the patented compound. These remarks are not made to decry the patent, but to show the importance of scientific knowledge to those engaged in the practice of the useful arts.

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59. For an improvement in *Machines for Hoisting Goods, or Weights, in Stores;* David Evans, city of Philadelphia, state of Pennsylvania, March 19.

The wheels ordinarily used in stores for hoisting goods, are, it is said, always constructed of wood; the patentee, however, means to make them of iron, but in all other respects they are to remain unchanged. Such a patent we consider as altogether valueless, and if we preferred a wheel of iron to one of wood, should unhesitatingly make it, maugre all the terrors of the patent law, and the seal of the United States.

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60. For *Attaching Bolting Cloths to Reels;* George M. Elliot, Hagerstown, Washington county, Maryland, March 19.

The reel is to be constructed in the ordinary way, with no other than such trifling variation as will adapt it to the mode of fastening adopted. The main feature of the improvement consists in the employment of two strips of wood, of the length of the ribs of the reel, to which are nailed the two ends of the bolting cloth, properly strengthened by strips of linen; these two strips, when brought together on their flat sides, form a rib external to the reel, and when they are affixed to each other by three, or more, screws and nuts, the cloth will be of the proper tension. The ends of the cloth are furnished with oilet holes, which pass over pins at each end of the reel. By this contrivance the cloth is readily removed, cleaned and replaced. The claim is "to the principle of affixing the cloth to the reel, so that it can be taken off and replaced with celerity and safety." We think the claim objectionable, as it is the mode only of doing this, and not the principle, that is patentable; had the word foregoing been inserted before principle, our objection would have been removed, as the acceptation of the word principle would then have been plain.

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61. For an improvement in the apparatus for *Spinning Cotton or other Fibrous Substances;* Asael L. Lanpher, Killingly, Windham county, Connecticut, March 19.

(See specification.)

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62. For an improvement in the *Mode of Fastening together the Planks of a Boat or other Vessel;* Thomas Blanchard, city of New York, March 20.

(See description, with specifications.)

63. For an improvement in *Buckets for Water Wheels;* William M. Eldridge, city of Philadelphia, March 20.

This wheel is called "the united power wheel," and the improvement is said to "consist in so constructing and arranging the buckets of a horizontal wheel, that the water when taken in at the top of the bucket, near the periphery of the wheel, and discharged at the bottom or side, shall act upon the wheel first with an impinging, and afterwards by a reacting power."

Various forms of construction appear to be contemplated: in the exemplification given, the buckets descend spirally down the periphery of a horizontal wheel, a hoop of wood, or of metal, surrounding them, and forming the outside of the wheel. A penstock rises above the wheel, and has a bottom just above it, through which there are openings to conduct the water upon the buckets in such a direction as to cause it to act by its impulse. The part claimed is "the form, shape, and position of the buckets, that being such as to combine the powers of impulse and reaction."

We have repeatedly spoken our opinion of such wheels, and see nothing in that before us to give it any superiority over some of its predecessors, as it varies from them but little, if at all.

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64. For a *Double Power Reaction Wheel;* William M. Eldridge, city of Philadelphia, March 20.

This is a very promising wheel, as the specification sets out with the information that it is "to give double power with the same water." Should this be correct, we see no reason whatever for stopping at a double power, the same principle being applicable to any extent.

A reaction wheel of the ordinary construction, with the penstock as usual, is first to be constructed; this wheel is to be surrounded by another, the inner diameter of which is such as will enable it to pass over the first, touching it as nearly as may be. From this outer wheel arms may extend underneath the inner one, the shaft of which is made hollow, to receive that of the outer wheel. The water is to be admitted into the inner wheel at its lower side.

The patentee says, "What I claim as my improvement or discovery, is the combining the powers of the two wheels, by applying the outer wheel to the circumference of the inner wheel, so as to receive the water as it is discharged from said inner or reaction wheel, which, in common reaction wheels now used, falls useless."

Should the water from the first wheel have any power to turn the second, this would simply prove that the first was badly constructed; and the contrivance before us would be much such a remedy for the defect as the placing two nine foot wheels, one below the other, where there was a fall of eighteen feet.

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65. For a *Nail Machine;* Melville Otis, East Bridgewater, Plymouth county, Massachusetts, March 20.

This is a machine for making and heading cut nails, and intended as an improvement upon Reed's machine for cutting and heading.

The whole machine is described, but the only thing claimed is the "adding to the machine heretofore in use, an instrument called the *spring nipper*, by means of which the nail is turned into the die, so as to be griped by the dies on its flat side, instead of the edges." The manner of constructing and of operating with the spring nipper, is particularly described; but for a clear understanding of these, the drawings would be necessary.

66. For a *Mortising Machine;* Jeremy W. Bliss, Somers, Tolland county, Connecticut, March 20.

This machine is described with a minute account of the measurement of its different parts, and is represented in the drawing with sufficient clearness, but there is no claim made to the general arrangement, or to any of its individual parts, whilst, as machines for mortising are numerous, and as the mode of boring to commence the mortise, and of operating with the chisel, are very similar in most of them, it becomes important to the patentee to be very specific in pointing out what he claims as new. In this machine the stuff to be mortised is placed upon a suitable bed, so that it may be bored by a bit at the lower end of a revolving, vertical shaft; the piece is then so shifted as to bring the part to be mortised under the chisel, and the band thrown from the whirl of the boring on to that of the mortising part, which, by a crank motion, operating upon a lever, works the chisel up and down.

67. For *Generating Steam;* Thomas Spalding, Mackintosh county, Georgia, March 22.

Boilers are to be made in any of the usual forms, and either of copper or of iron, as may be preferred. The bottom of the boiler is to be double, allowing a space of some inches between the two plates, and to the upper one, tubes are to be attached which are to rise up through the water, and top of the boiler, into the atmosphere, thus opening a free communication between the above named space and the air. This space is to be filled with tallow, or other animal or vegetable oil, which becomes an intermedium through which the heat must pass from the fire in arriving at the water. The upper part or the boiler, is to be "of either copper, or iron, *tinned iron*, or cast iron," and over this is to be laid hemp, or hemp cloth, saturated with paste or glue, in such thickness "as may give a perfect security against the possibility of bursting under any pressure that can possibly be required." Reference is here made to some experiments performed in France, tending to prove that hemp, kept together by glue, is twice as strong as English bar iron of the same section.—Over all these a light net work of copper or iron is to be placed. Strong hoops of iron are also to be employed, to give additional support to the boilers. Safety valves, &c. as usual, are to be employed.

Should the water become entirely exhausted from the boiler, we are told that the tallow will then evaporate, with a peculiar noise and a characteristic appearance, "and give an admonitory sound sufficient to alarm any passenger." We think, however, that there would in

case of such alarm, be more fear than danger, as empty boilers are not apt to burst. What benefit the hemp and glue can produce, unless they are continued all round the boiler, excepting as bad conductors, we cannot perceive; in contact with the fire, they would not certainly be very available. The intermedium of tallow appears to present several disadvantages without any corresponding benefit; and, in fact, the whole plan seems to manifest a want of practical knowledge of the subject to which the patent refers.

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68. For a *Machine for Cleaning Fur;* Shepherd Whitman, New Albany, Floyd county, Indiana, March 22.

The fur is to be placed in a box, or case, about seven feet long, in which it is to be acted upon by a blowing apparatus, or wind wheel, for the purpose of separating it from the hair. The wind wheel is of the usual construction, but there are wire points fixed along the edges of the vanes, to pick the fur; there are two rollers within the box at the lower end, around one of which a revolving apron passes, while the other is borne down upon it by means of springs. This latter roller has fur glued to it, the better to hold and press the fur to be acted upon. The far end of the machine is in the form of a vertical half circle, covered with a wire hurdle, through which the hair passes, the fur adhering together, and being blown round, without passing out with the hair. When necessary, the fur is to be acted upon several times. The description is not very clearly given, and the drawing is an indifferent one.

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69. For a *Thrashing Machine, and Horse Power;* John V. A. Wemple, Florida, Montgomery county, New York, March 25.

After describing the thrashing machine, a claim is made to "the formation of the teeth, and the construction of the dust discharger; also the lining of the boxes with zinc."

The formation of the teeth presents nothing peculiar; the dust discharger is an opening left in the cover; and the boxes in which the journals of the cylinder run, are to be of cast iron, lined with zinc. We advise, by all means, that the boxes be cast hard, and that the *improved* lining be dispensed with.

In the horse power, the claim is to "the construction of the frame, and the application of the gearing," in neither of which is there any thing that can be called an improvement. There is another strong objection to this patent; namely, it includes two distinct and separate machines, as the horse power no more makes a part of the thrashing machine, than it does of any other instrument which it might be employed to drive.

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70. For an improved *Floating Dry Dock*, invented by John Thomas, of the city of St. Louis, Missouri, and assigned by him to James H. Peck and others, to whom the patent has issued; March 26.

We must give a very brief description of this apparatus, abstracted

from upwards of twenty closely written pages of specification. This floating dock is intended to be passed under a steam-boat or other vessel, by filling the floats of which it is composed, with water, which is then to be pumped out, giving to the dock sufficient buoyancy to raise its load above the water. There may be nine rectangular floats, each sixty feet long, four wide, and four feet six inches deep, their sides being all parallel, and their decks flush; they may be arranged side by side, so as to form a large floating dock. A cradle to sustain the vessel to be raised, is made in separate parts, so as to fix properly on the general deck of the combined floats. Each float is divided into compartments by partitions, for the purpose of giving it the necessary strength, but there is a free communication between these compartments, to allow of the pumping out of the water, when the vessel is to be raised, particular provision being made for this purpose by apparatus specially described; but the limits which we have prescribed to ourselves prevent our touching these and other parts. "Which said partitions, decks, chambers, trunks, well, floats, and union of several floats together, to form the dock, are all, and every of them, new and useful improvements on the floating dry dock invented by the said Thomas, for all and every of which he solicits a patent, according to the laws of the United States in that behalf made and provided."

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71. For a *Machine for Hulling Clover Seed;* William E. Lukens, Cadiz, Harrison county, Ohio, March 26.

A cylinder is to be made, the periphery of which is covered with iron, cast in segments, with indentations, or furrows, for rubbing out the seed; and under this there is to be a concave, enclosing the cylinder for nearly one-half its circumference. There is nothing special in the construction of any part, or that is likely to render it superior in any respect to the machines already in use, some of which are very similar to it. The claim is to "the peculiar combination and arrangement of the several parts, but particularly the mode of preventing the seed from crowding in the end of the cylinder, and of conducting it to the place of escape."

The method of preventing the crowding, above alluded to, is the spiral direction given to the flutes on the cast iron segments of the roller, and of corresponding segments placed within the concave. There are some special directions given respecting the manner of forming and of uniting certain parts, but these, not being illustrated in the drawing, are somewhat obscure.

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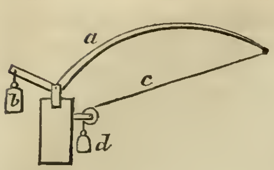
72. For an improvement in the *Application of the Lever Power;* Jacob Cochran, South Hadley, Hampshire county, Massachusetts, March 26.

This invention the patentee denominates "Cochran's Accumulating Lever," but if he makes no other discovery to which his name may be attached, and with which it may swim down the stream of



time, it will sink at an early part of the voyage. *a* is the lever, the long end of which is bent as shown, and to the short end is suspended *b*, the weight to be raised. *c* is a returning lever, chain, or cord, which is to pass over a pulley, as shown, and a small weight, *d*, attached to it, "when it will be found that with equal speed and time, a less weight applied to the lower extremity of the returning lever, will raise or put in motion, a greater weight or power applied to the end of the lever first mentioned," (the short end.)

We do not think it necessary to insert the claim, or to waste a word of reasoning upon the subject of the contrivance.

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73. For a *Rotary Coal Sifter;* Jesse E. Dow, William M. Edwards, and Samuel Davis, Charlestown, Middlesex county, Massachusetts, March 27.

The rotary coal sifter is to be made of wire, sheet iron, or other material, so that it may have openings to retain pieces of coal of the size required. It is to be cylindrical, hung in an air tight box upon gudgeons, and to be turned by a crank. It, however, may be used without the box, and the inventors claim it in all forms and positions, and also "the right to screen coals at wharves, or at mines, on a large scale; and they claim the shape of the sifter, and all its parts, as their own invention."

Some of the coal merchants on the rivers Schuylkill and Delaware, and in other places, would think it somewhat hard to pay for a right to use their old machines, after employing them for years untrammelled by any claimant; we advise them, however, not to be very much alarmed, as there is no probability of their being amerced in ruinous damages for so doing.

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74. For a machine for *Raising Building Materials,* called a "Builder's Tender," Chester Samson, Brattleboro', Windham county, Vermont, March 27.

An inclined plane is to be made of plank, reaching from the ground to the scaffolding; the materials wanted are to be put into a carriage upon four wheels, and drawn up by means of a rope and windlass.

Although patents are frequently obtained for contrivances which are old and worthless, we do not often meet with one so truly trifling as that before us, and so little applicable to the purpose which it is intended to answer. An inclined plane, successively altered in its elevations, until it reach the top of a high building, is not likely to be much used.

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75. For a *Thrashing Machine;* Silvanus Leonard, Hampden, Penobscot county, Maine, March 27.

In most instances, an attempt is made to prove that there is something new in the thing patented, although it may be nothing more

than a bolt, a pin, or a nail, used or driven in a new place; in the present instance, there is a part which is denominated the "inclined graduating slide, so acted on by springs at its extremity, as to sink, or yield, should any foreign substance, as stone or wood, come in contact with the beater; thereby avoiding the risk of damage hitherto incurred when these parts are fixtures." The graduating slide is but another name for the concave, which, we have no doubt, has, in at least a hundred of the patented thrashing machines, been prescribed to be hung upon springs. Neither this, however, nor any thing else, is claimed as new, and it is a mere matter of inference, therefore, that it was intended to be presented as such.

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76. For a *New Fibrous Material to be used in Manufactures;* Margaret Gerrish, Salem, Essex county, Massachusetts, March 27.

The new material designated as the subject of this patent, is obtained from the cortex of the *asclepias syriaca*, known under the common name of *silk weed*, or *milk weed*, and *Syrian swallow wort*, a native of the United States. The description of it in Dr. Bigelow's "Florula Bostoniensis," and in other works, is alluded to in the specification. The mode of obtaining the fibres, recommended by the patentee, is to take the stems, divide the bark longitudinally into four parts, and strip it off, which may be effected with much facility. On making a partial transverse section and bending the bark, the glossy, silk-like fibres, make their appearance, and may be drawn out in lengths of from two to three feet. After the necessary preparation, these fibres may be spun, coloured, and used as other fibrous materials. The specification contains a good deal of matter which may be considered as altogether extraneous in such an instrument, as it has nothing to do with the security of the patent; we therefore, pass this part over, having stated the object of the patent, which is simply to secure the right to the introduction of the substance designated as a new material for the manufacture of thread, cloth, and other similar fabrics.

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77. For an improvement in the *Gridiron;* Ami Clark, Berlin, Hartford county, Connecticut, March 28.

This gridiron is to be made round, square, or otherwise, and is to revolve upon its centre, like other revolving gridirons. The bars also, are to be fluted, as heretofore, for the purpose of collecting the gravy; but it is to differ from other gridirons much in the same way in which the kangaroo differs from other quadrupeds, namely, in the relative length of its hind and fore legs, in order to give to the gravy the proper disposition to descend into the receptacle prepared for it. Those cooks who have gridirons with legs of equal length, if any such there be, which we very much doubt, will, we hope, consider themselves as still at liberty to prop them on one side, in any degree which they may find convenient; and should there be in existence such a thing as a gridiron with fluted bars, a trough for the gravy, and hind legs longer than the fore, such as we remember to have seen in those

days when a sop in the pan was accounted a great delicacy, it may continue to stand out of the horizontal, without obtaining a new lease.

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78. For an improvement in the *Steam Engine;* Zechariah Allen, Providence, Rhode Island, March 28.

The intention of the improvement proposed in this patent, is the cutting off the steam at any desired part of the stroke, so as to allow it to work expansively during the remainder of it; and were we uninformed respecting what has been done upon this subject, the specification before us would lead to the conclusion that the effecting this was in itself a novelty, whilst those well acquainted with the history of the steam engine, are aware that it was done by Watt, and that at an early period of his career of improvements in the steam engine. Various plans have been devised for effecting this object, and the best engines are now thus worked.

The patentee considers the ordinary action of the throttle valve, as operated upon by the regulator, to increase or diminish the supply of steam from the boiler to the cylinder, as destructive of the power of a considerable portion of steam, and says that his "improvement consists in so arranging the apparatus of the steam valves as to cause the steam to pass freely from the boiler to act upon the piston with its full pressure during a longer or shorter period, or portion of each respective stroke, instead of wasting ineffectually the force of the steam by choaking its passage through the throttle valve, which, as its name figuratively implies, throttles the steam in the pipe, in its progress from the boiler to the engine, in order to destroy a portion of its too active force." "A portion of the steam is unprofitably wasted by being *wire drawn*, as it has been termed, through the contracted passage of the throttle valve," and more to the same effect. We dissent entirely from this doctrine, being convinced that there is very little, if any, loss of power from the prescribed cause, but merely a diminished quantity expended, the remainder being packed in the boiler for future use. One of the advantages of using steam expansively, results from the accordance of its action with the crank motion, as connected with a reciprocating piston. The stroke is to be gradually stopped, at each end of the cylinder, and the admission of steam during the whole stroke, is necessarily wasteful in the extreme. We, however, must leave the discussion of this point, as occupying more space than can be here afforded to it.

The patentee has described and figured a plan for cutting off the steam at different parts of the stroke, but as it appears to be intended as an exemplification of a general principle, he has not claimed it; in this point we think him incorrect, the principle being old, and the particular plan, we believe, new. The lever which is to open and close the valve of the induction pipe, is to be operated upon at its extreme end by a cam, the lifting part of which is wedge-shaped, and the lever being capable of bearing on its wide or its narrow end, opens the valve for a longer or a shorter period. The shaft, or axis, of the lever is a screw, and a whirl upon this shaft, acted upon by a regu-

lator, or governor, causes the lever to traverse upon its shaft, and thus cuts off the steam at an earlier or a later period of the stroke.

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79. For a *Portable Oven;* David Hull, Utica, Oneida county, New York, March 28.

There is to be an oven of tin, or other material, that is to have a door on one side through which to introduce the article to be baked. Two or more vertical pipes, apparently like stove pipes, are to pass through the oven, and these are to have gratings at their lower end to sustain the fuel, which is to be put in at the upper ends of the pipes. Near to the upper ends there are dampers to close the pipes when the fire is in full action, and under their lower ends, cups or dishes are to be placed to receive the ashes. "The principle upon which the petitioner's oven operates is in the use of fuel in such a manner that none of the heat to be created thereby shall be lost or wasted," a principle which appears to be as imperfectly carried out in this contrivance, as in most of its predecessors.

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80. For an improvement in the *Fliers of Double Speeders;* Otis Pettee, Newton, Middlesex county, Massachusetts, March 28.

The fliers of double speeders are usually made of several pieces of metal, the arms of wrought iron, the nose of steel, the bottoms of wrought iron, or steel, and the tubes of copper; the improvement consists in making the flier in one entire piece of malleable cast iron, in the manner described. The part which is to form the groove is, when delivered from the mould, open like the pod of an augur, and requires to be closed. The flier is formed into proper shape, and straightened by a pair of heavy dies fixed in a drop press, and the tubes are formed by dies made for the purpose, which close the open pod, so as to leave the required groove. The process is described with sufficient clearness, and the plan appears to be one which offers no small saving in the formation of the article patented.

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81. For an improvement in the *Machinery for Spinning Cotton;* Welcome A. Potter, Cranston, Providence county, Rhode Island, March 28.

Two metallic washers are to be substituted for the cloth washers, and are to regulate the drag of the spindle. The washers are to differ in size, the larger, represented as exceeding that of a dollar, is to be secured to the wave or bobbin rail by small screws, the spindle passing through a hole in its centre; the smaller washer, about the size of a large quarter dollar, is to be secured on to the end of the bobbin. This has a projecting rim, or fillet, on its edge, and, we suppose, that the friction of this upon the lower washer is to regulate the drag; in this, however, we are left to conjecture, and whilst employed in guessing, we guess that the friction created in this way will be very unequal, and not susceptible of being regulated.

82. For *Manufacturing Wire of Different Forms, and of Various Metals;* Thomas Wallace, Haverstraw, Rockland county, New York; an alien who has given notice of his intention to become a citizen of the United States; March 28.

The wire is to be formed, in the well known way, by grooved rollers, the employment of which makes no part of the claim, the improvement consisting in making the wire from circular plates of metal. Sheet metal is to be cut into circular disks, and these are to be cut into strips by circular revolving shears, the circular sheets being perforated at their centres, to allow them to pass over a pin fixed in a slide on a rail-way, by which they are fed to the shears. The claim is to "the cutting out a continuous rod, line, or thread, from a circular piece of sheet metal, as if it was merely uncoiling it, and making wire from such rod, line, or thread, of metal."

The patentee has left a request at the office that his patent might not be published in this Journal. What motive he has for making this request is not stated, and he is hereby informed that it is one which is not in the power of the office to grant, and over which it has no control; if he has any complaint to make, therefore, it must be directed against the Editor alone, who, knowing no reason why the request should be complied with, pursues his usual course. Patents are public instruments, and every citizen has a right to obtain and publish any specification; without this, the public would be liable to perpetual imposition from the patenting of machines and processes in use elsewhere. Had the request been made to the Editor, without the statement of a satisfactory reason, it would not have been complied with, although he is always willing to *delay* the publication of patents, in order to promote the interest of patentees, provided that of the public does not appear to be thereby compromitted.

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83. For a *Lamp for Burning Alcohol and Spirits of Turpentine;* Daniel Gilbert, Brattleboro', Windham county, Vermont, March 29.

In this lamp the alcohol and turpentine are to be separately converted into vapour, and to be ignited as they combine. A metal lamp is to be divided into two compartments by a horizontal partition, which may be at about one-third of its height from the bottom. The lower chamber is to be filled with spirits of turpentine through a tube leading into it, and extending above the top of the lamp; a similar tube enters the upper chamber, for the purpose of filling it with alcohol. The burner, in the centre of the lamp, and extending to the height of some inches from the top, consists in part of two concentric tubes, with a space between them; the inner of these tubes extends down into the turpentine chamber, and is furnished with a wick, reaching nearly to its top, in order to raise the spirit by capillary attraction; the larger tube descends into the alcohol chamber, whence that also rises by means of cotton or other fibrous material occupying the space between the two tubes, this cotton also terminating at the same distance below the top, as the turpentine wick. A

brass cap screws into the upper end of the burner, and has lateral perforations in it, through which the vapour escapes, and at which it is to be ignited; by raising or lowering the cap, the apertures may be enlarged, or lessened.

To adapt the common lamp to the purpose, two parts of turpentine, and one of alcohol, are to be put into it, the alcohol being of such strength as to float upon the surface. The tube is to be provided with its cap, and managed, generally, as in the former instance.

We do not believe that this lamp will be approved, as there are no means of regulating the proportionate quantities of the spirits which are to enter into combustion, and there will frequently be a strong smell of oil of turpentine. The plan of Mr. Jennings, in which the two fluids are perfectly combined, is, we think, altogether to be preferred on several accounts, but they are both dangerous.

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84. For a *Steam Boiler;* Russel Jarvis, Boston, Massachusetts, March 29.

The ordinary cylindrical boiler is to be surrounded by a strong case, like a second boiler; and from this, safety tubes are to lead to the outside of a boat or building, which safety tubes are to carry off the steam and water, should the boiler explode within the case. The fire hole, or flue, must pass through the heads of the outer case, which heads are represented as in close contact with those of the boiler.

The inefficiency of the plan proposed must be apparent to any one who has duly considered the force exerted in most of the explosions which have taken place. The idea of the contents of the boiler passing through the safety tubes, is altogether futile, and the danger from the collapsing of the flue, has not even a pretended preventive in the plan before us.

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85. For an improvement in the *Construction of Wheels for Carriages, in order to prevent Horses running away;* Russel Jarvis, Boston, Massachusetts, March 29.

The specification of this patent is contained in but few words, informing us that the invention consists in the fixing of teeth to the inner end of the hub, and the hinging of bars upon the axletrees, the outer ends of which may be made to catch between these teeth, when a string is drawn by the driver, or passengers, in case of the horses running away.

Among the various plans devised for the same purpose, we think this one of the most objectionable; to attempt to stop the motion of the wheels suddenly, when horses are running away, by a bar falling into teeth so close to the centre of motion, would be vain; something, assuredly, must give way before the power exerted. On a former occasion, when a similar plan was patented, in which the spokes were to answer the purpose of the teeth in the present instance, we observed that "a contrivance for breaking spokes" would be a suitable title for the invention. A brake acting upon the rim would be generally preferred to a break close to the hub.

86. For an improved *Ventilating Stove;* Daniel Quimby, Calais, Washington county, Maine, March 29.

The patentee claims "the ventilating apartments by air passing between, and in contact with, sheets of heated iron, or some other metal that will withstand fire," a claim about as valid as the ventilating them by perforating them for doors and windows. The plan proposed of carrying this principle into effect is so old, that the period of its invention, and the name of its inventor, are both lost among the records of "auld lang syne." It consists in making a stove with double plates, the fire being contained in the inner box, and air admitted through a tube, or tubes, into the space between the two, and conducted off by others, as required.

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87. For a *Retaining Oven for Baking and other Cooking;* Stephen J. Gold, Cornwall, Litchfield county, Connecticut, March 29.

The oven, as represented, is made square, much like those frequently set in the jambs of kitchens. It is to be made of double sheet tin, or other material that is an *imperfect conductor of heat*, (we had supposed tin to be a very good conductor) and air, another imperfect conductor, is to be confined between the sheets of metal. There are to be shelves within, and the furnace is also to be placed within, in a hole, or receptacle prepared for it at the lower part; a smoke pipe leading out through one side. The claim is to "the location of the furnace, that is, inside an oven, or air confining oven."

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88. For a *Furnace for Warming Rooms with Rarified Air;* John Bouis, Baltimore, Maryland, March 29.

This furnace is to be placed in a cellar, and is furnished with tubes for the distribution of heated, and the supply of cold air, in a manner resembling many other structures for the same purpose. Some of the tubes are to be double, charcoal in powder being put into the cavity between them. The brick walls enclosing the fire are also to be double, and to contain pulverized charcoal between them. We do not perceive in any part of the arrangement any thing special by which to characterize it. The claim is to the "described apparatus for warming rooms; particularly the double walled chamber containing the pulverized charcoal, which encloses the apparatus, and serves as a nonconductor, for warm or cold air; the receiver, with the pipes connected with it; the continuous pipes that receive the cold air from the apartments to be heated; the double pipes with pulverized charcoal; and the reservoir for containing water for tempering the heated air."

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89. For *Improvements in Lamps;* Jacob Keim, city of Philadelphia, March 29.

(See specification.)

90. For *Stoves for Cooking and other purposes;* John Harriman, Haverill, Essex county, Massachusetts, March 31.
(See specification.)

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91. For *Welding, or Cementing together Scraps of Horns, Hoofs, Whalebone, &c.;* Arad B. Newton, city of Baltimore, March 31.

This specification describes processes which are well known, and have been long practiced; a press also, is described, in which a follower is forced down upon a bed piece by two nuts, acting upon male screws, in the ordinary way. Two pieces of horn, shell, hoof, &c. intended to be united, are fitted together, with their surfaces perfectly clean, and are to be placed in a press, or vice, taken out of boiling water; when firmly screwed together, they are to be boiled for fifteen or twenty minutes. Scraps are to be treated in a similar way, but they must be forced into moulds of the form intended to be given to the article. These substances, it is observed, may be united by heat, without the presence of water, but the process by means of the latter is preferred. With all this, and much more, we have been acquainted for many years, and when first known to us, it was old to the workmen in the materials spoken of. The only article in the specification in which we find any novelty, is the information "that soft water, as rain or other light water, answers both for horns and hoofs, but for whalebone, and shell scraps, salt water is found to answer best." Of the correctness of this remark, we have but little doubt, and are of opinion that it results from the latter articles requiring more heat than the former; and salt water, when boiling, is at a higher temperature than that which is fresh.

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92. For improved *Bedstead Fastenings;* Perry Prettyman, Georgetown, Sussex county, Delaware, March 31.

The rails are to be tenoned and the posts mortised, in the way usual when screws are used. The rails are to be bored, as for screws, and an iron bolt is to be driven into the holes, and securely pinned there; the outer ends of these bolts are to be formed like the catch of a thumb latch, the catch part not being square, however, but forming an angle somewhat obtuse with the shank of the bolt; the catch, or hook, stands about one-fourth of an inch clear of the tenon. An iron plate, mortised to admit the catch, is screwed firmly against the bottom of the mortise in the post, and when the catch enters through the mortise in this plate, and is forced downwards, the rail is drawn close to the post, and the weight upon the bedstead tends to keep them always together. The tenon is to be shouldered down at the ends, to allow of the necessary play, and to cover the mortise when the bedstead is put together. The claim is to "the peculiar arrangement of the oblique shouldered hooks or catches, fastened as herein described, in the ends of the tenons of the rails; and the straps in the bottoms of the mortises, so as to produce a close fitting connexion of the parts, and at the same time easy to be put together, or taken apart."

93. For *Machinery for Boring and Mortising Hubs for Wheels;* Robert M'Carty, Martinsburg, Lewis county, New York, March 31.
(See specification.)

Specifications of American Patents.

Specification of a Patent for Improvements in the Steam Engine, and the mode of propelling therewith. Granted to John Brown Emerson, *city of New York, March* 8, 1834.

To all whom it may concern, be it known, that I, John Brown Emerson, of the city of New York, have invented certain improvements in the steam engine, and in the mode of propelling therewith, either vessels on the water, or carriages on the land, and that the following is a full and exact description thereof.

One object of my improvement is to substitute for the crank motion a mode of converting the reciprocating motion of a piston into a continued rotary motion, by a new combination of machinery for that purpose. This mode is applicable to an engine either with one or two cylinders, and is carried into effect as follows:—Along side of the cylinder I place a shaft, the lower end of which may revolve in a step on the platform, or foundation upon which the cylinder stands; in which case it must be somewhat longer than twice the length of the cylinder, as it must extend above it to a height somewhat greater than the length of the stroke of the piston. Sometimes, however, this shaft may have its lower gudgeon only a small distance below the upper end of the cylinder, whence it must extend above it, as before. Its upper gudgeon must, of course, be sustained by a suitable frame. This shaft is to stand parallel to the piston rod, from which it is to receive its revolving motion. Upon the upper end of this shaft, above the top of the cylinder, there is to be placed a solid cylinder of wood, or of any other convenient substance, of such diameter as shall cause its periphery to come nearly into contact with the piston rod, for its whole length, when the piston is raised.

The solid cylinder, above described, is to be made to revolve in the following manner: I make a groove in it which commences in its lower end, and passing spirally, extends half way round it by the time it reaches nearly to the upper end, or to a distance, vertically, equal to the stroke of the engine; from that point it passes down, around the opposite half, and returns into itself at the point of beginning. Upon the upper end of the piston, against its side, I place a friction roller, which is to work in the groove in the solid cylinder, the piston rod rising between parallel guide pieces, by which it is kept in its proper place, and its tendency to turn round by the action of the roller in the groove is checked. When the piston is down, this friction roller will stand in the V formed junction of the grooves on the opposite sides, and as it is raised, it will, in its passage to the upper junction, give half a revolution to the solid cylinder, and in descend-

ing, will complete the revolution by the action of the friction roller on the other portion of the groove.

When two steam cylinders are used, they are to be placed parallel to each other, and at such distance apart that the pistons of each may in like manner act upon the solid cylinder, the piston of one being up, when the other is down. The boiler, the steam pipe, the valves for the admission and discharge of steam, and other appendages, may be similar to some of those already in use.

From the revolving shaft, already described, a rotary motion may be communicated to paddle wheels, steam carriages, or other objects. As it is my intention, in general, to place my cylinders and revolving shaft vertically, I communicate motion to the horizontal shaft of a paddle wheel by means of bevel geared wheels near the lower end, or at any convenient part of the shaft; and by similar gearing, carriages may be propelled upon rail, or ordinary roads.

When used for steam-boats, I employ an improved spiral paddle wheel, differing essentially from those which have heretofore been essayed. This spiral I make, by taking a piece of metal, of such length as I intend the spiral propeller to be, and of a suitable width, say, for example, eighteen inches; this I bend along the centre, so as to form two sides, say of nine inches in width, standing at right angles, or nearly so, to each other, and give to it, longitudinally, the spiral curvature which I wish. Of these pieces I prepare two, three, or more, and fix them on to the outer end of the paddle shaft, by means of arms of a suitable length, say of two feet, more or less, in such a position that the trough form given to them longitudinally, shall be effective in acting upon the water. It must be entirely under water, and operate in the direction of the boat's way. Instead of metal, the spiral propeller may be formed of wood, worked into the proper form; the shape, and not the material thereof, being the only point of importance.

Where a capstan is required, as on board of a steam-boat, I allow the upper end of the vertical shaft before described, to pass up through the deck of the vessel, and attach the capstan thereto, so that it may be made to revolve by the action of the shaft, using such rag wheels and palls to connect the shaft and the capstan, as will allow of their being conveniently engaged and disengaged.

What I claim as my invention, and for which I ask a patent, is the substituting for the crank, in the reciprocating engine, a grooved cylinder, operating in the manner hereinbefore described, by means of the piston rod; together with all the variations of which this principle is susceptible. As, for example, a bar of metal may be bent in the form of the groove, and attached to the revolving shaft, and friction wheels on the piston rod may embrace this on each side, producing an effect similar to that produced by the groove.

I also claim the spiral propelling wheel, constructed and operating in the manner which I have set forth; and likewise the application of the revolving vertical shaft to the turning of a capstan on the deck of a vessel. Not intending, in either of these parts, to confine myself to precise forms or dimensions, but to vary them in such manner as

experience or convenience may dictate, whilst the principle of action remains unchanged, and similar results are produced by similar means.

JOHN B. EMERSON.

Specification of a patent for improvements in the mode of constructing and combining bells for horses. JASON BARTON, *Cairo, Greene county, New York, March* 18, 1834.

To all whom it may concern, be it known, that I, Jason Barton, of Cairo, in the county of Greene, and state of New York, have invented an improvement in the mode of constructing and combining bells, in such a way that two, four, or a greater number, may be struck by a single tongue, clapper, or hammer, at the same time; which combined bells are intended to be attached to the ames, or other parts of harness for horses; and which may also be advantageously used in military and other bands of music, in the place of triangles, and other instruments which are employed for a similar purpose. And I do hereby declare that the following is a full and exact description of my said invention.

Although more than four bells may be combined together upon my plan, I will, for the sake of facility in description, suppose that to be the number employed. I cast two bells, of any suitable metal, or mixture of metals, each of which bells is to be hemispherical, or in such form that when their edges are made to approach each other within half an inch, their outline will be a sphere, say of four inches in diameter; these bells are to have holes in their centres, like ordinary clock bells, for the purpose of attaching them together. This, it is evident, might be done by a straight rod of metal, with suitable screws and nuts; but instead of this, I make a ring, or hoop, somewhat less in diameter than the inside of the bells, and from the periphery of this, on opposite sides, project two spurs, or pins, which pass through the holes in the bells, and are attached to them by nuts.

I then take two other bells of a larger size, say of five inches in diameter, and in the same hemispherical form. These are to surround the others, and are attached to the same ring; for this purpose, two other spurs, or pins, project from the ring, midway between those first named, and passing through the space between the first pair of bells, serve by screws and nuts to secure the outer pair concentric with them. A pin, or piece of metal, projects from the interior of each of the bells, pointing towards their centres, for the hammer to strike against. Those on the two outer bells pass through the space left between the inner ones, and those on the inner bells are as close as may be to them, so that they all terminate near enough to each other, and are of such length, that they will receive the blow at the same time. These pins may be cast of the same metal with the bells, or pins of hard iron or steel, tinned and laid in the mould, may be used, should it be found that the others have a tendency to batter up.

The tongue, clapper, or hammer, which is to strike these pins, stands in the middle of the hoop, or ring, within the inner bells, where it is hung by means of a spiral coil of steel or iron wire, attached by

one end to the ring, and by the other to the hammer, which may be in the form of a flat disk of metal, of such thickness as will give it sufficient weight. When so fixed, a slight agitation will bring it into contact with the four projecting pins upon the peripheries of the bells. The outer bells may approach each other very nearly, say within one-fourth of an inch; and the whole may be of any size desired.

The two spurs, or pins, by which the outer bells are fastened, serve also to receive the bale, or ring, which is to serve as a support for the apparatus, and by which it is to be attached to the ames, or wherever else it is intended to be used.

What I claim as my invention, is the combining together any convenient number of hemispherical bells, concentrically, and placing within them, a single hammer, or clapper, which may strike the whole at once, whether the same be arranged precisely in the manner here described, or in any other in which the same principle obtains, and a similar effect is produced. Jason Barton.

Specification of a patent for Hulling and Cleaning Clover Seed, and for other purposes. Granted to David Rankin, *Augusta county, Virginia, March* 18, 1834.

To all whom it may concern, be it known, that I, David Rankin, of the county of Augusta, in the state of Virginia, have invented an improved machine for the hulling and cleaning of clover seed, and which may also be used for the cracking or breaking of corn, for hominy, or for horse feed; and I do hereby declare that the following is a full and exact description thereof.

The part of the apparatus which is employed to hull the seed, consists of a hollow frustrum of a cone, having a conical nut revolving within it, both made of cast iron, fluted, in the manner of many mills used for grinding bark, corn, and other substances. The axis of the conical nut, or runner, is placed horizontally, and there is an opening made on the upper side of the shell, or hollow cone, towards its smaller end, through which the seed is to be fed. This is surmounted by a hopper, and the hulled seed and chaff escape at the larger end of the cone, whence they fall upon a double, inclined, sieve, or riddle; the meshes of the upper sieve separating the grosser portions of the chaff; and those of the lower allowing the seed and dust only to pass through, which, as they fall, are operated upon by a fan wheel, and the cleaning thus effected.

The nut, or runner, I cast in segments, dividing the whole circumference thereof into five or six parts; these I unite together by means of suitable heads, to which they may be attached by screws, or otherwise; or the segments may be fastened on to a cone of wood, or united in any other way which shall allow the passing an axis through the centre of the cone.

On the axis at the smaller end of the cone I place a whirl, and below this a wheel, turned by a crank, a band from which passes round the whirl; or, if preferred, a wheel and pinion may be substituted for

the whirl and band. The shaft of the wind wheel, or fan, which is at right angles to that of the nut, is also turned by a band from the crank wheel, which is conducted round to a whirl or pulley upon its end, by means of friction pulleys on one corner of the frame. I employ tightening, or regulating screws, one at each end of the shaft of the runner; and by means of these I can regulate the feed in the most perfect manner, causing the conical runner to approach nearer to, or to recede from, the hollow cone, as may be found requisite; the gudgeons having a longitudinal play for that purpose.

What I claim as my invention, and for which I ask a patent, is the application of the conical cast iron nut and shell, constructed and arranged in the manner herein described, for the purpose of hulling clover, and other similar seeds; and the general combination of the whole, for producing the intended effect; not meaning thereby to claim the screens, the fan, or other well known parts of similar machines, as making any part of my invention, but only that particular combination of them which I have adopted.

David Rankin.

Specification of a patent for an improved Cooking Stove. Granted to Elisha D. Payne, *city of New York, March* 8, 1834.

To all to whom these presents shall come, be it known, that I, Elisha D. Payne, of the city of New York, have invented an improved stove for cooking, and the principle of which is applicable to other purposes, which I denominate the revolving and sliding furnace stove; and I do hereby declare that the following is a full and exact description thereof.

I intend, in general, to make the body of this stove circular, and to fix the fireplace, or furnace, in such a manner as that it shall be capable of revolving with the plate which forms the lower part of the heat chamber of the stove. Sometimes, however, it may be found convenient to make the stove rectangular, and to shift the lower plate of the heat chamber by a sliding, instead of a revolving, motion; both of which modifications I will describe, commencing with that in the circular form, which I deem the best.

This stove may be made of any size which may be desired, and the proportion of its respective parts varied, as experience, or convenience may dictate; I do not, therefore, by any dimensions which I may give, intend to limit myself in this particular, but merely to assume such dimensions for convenience in description; and although I shall suppose most of the parts to be made of cast iron, I intend to use any material which may be adapted to the purpose.

The upper plate of the stove is to have a hole in the centre of it, surmounted by a tube, or neck, to receive the pipe by which the smoke and heated air are to be discharged; and near its periphery there are to be openings to receive stew pans, pots, kettles, bake irons, or other cooking utensils. From this upper plate, descends a cylindrical rim, from one to four, or more, inches in width; and on the lower edge of this rim there is to be a flanch, or bearing pieces, upon which the

lower circular plate is to rest, and to be capable of revolving; this plate, or circular disk, is to fit nicely within the cylindrical rim before described; and the space between it and the upper plate constitutes the heat chamber, and the vent for smoke, through the centre opening.

When the stove is large, the lower revolving plate may be sustained upon friction rollers; and it should be furnished with a circular rack, extending round it, near to its outer edge, into the teeth of which, a pinion, turned by a crank, is to match, for the purpose of turning it. The stove may stand upon legs descending from its rim, one of which legs will serve as a support for the pinion; it may, however, be suspended by iron rods from the ceiling; and the legs be thus dispensed with. When of moderate size, the lower plate may be turned by a lever without the aid of a rack and pinion.

The furnace, or grate, for containing the fuel, is attached to, and descends below, the revolving plate, immediately under the openings left in the upper plate, for the reception of cooking utensils. The fuel may be of any kind, and may be supplied through a door made for that purpose, in the outer side of the furnace; or it may be passed through one of the openings in the upper plate. The box, or chamber, of the furnace, may be made close, or may have bars at one or more sides of it, for the purpose of roasting before an open fire.

Concentric with the outer rim of the heat chamber, I usually place a second rim, or hoop, which is of such width as to occupy the space between the upper and the lower plate, but not fitting against them so tightly, as to prevent its revolving, in the manner to be described. This hoop, or rim, I do not make a complete circle, but leave an opening in it sufficiently large to admit the smoke and heated air to escape through into the smoke pipe. This opening may be equal to one-eighth of the circle, more or less, according to circumstances; and the diameter of the rim need be but little more than that of the pipe, the opening into which it surrounds.

To cause the heated air from the furnace to pass round in the heat chamber, instead of escaping directly into the pipe, I place valves, or registers, within the chamber, extending from the exterior to the interior rim, in a radial direction, and between the openings in the upper plate, which, when closed, may be made to direct or confine the current, as desired. Of these valves, or registers, there may be any number, although, in many cases, one or two will answer the purpose. The interior hoop, or rim, is to be made to revolve independently of the lower plate, which may be managed in various ways: that which I prefer is the following:—I pass a vertical shaft up through the centre of the lower plate, which shaft rests upon a suitable step at its lower end, its upper end being received in a cross bar left in the upper plate, at the opening for the stove pipe. This shaft, within the chamber, may be made square, and pass through a square hole in the middle of a bar, or of horizontal arms attached to the revolving rim within the heat chamber; this affords the means of giving to the opening into the pipe, any position which may be desired. A lever, or handle, projecting from the shaft, below the lower plate, will, i standing immediately under, or in any known relative position to tha

opening, serve to determine its situation. A shoulder, or projecting collar, should be left on the vertical shaft, to come in contact with, and to support, the lower plate.

The same general principle of shifting the furnace, may be applied to a stove of a rectangular form. In this case, the lower plate, instead of revolving, is to be made to slide longitudinally; the heat chamber being formed by an upper plate, and sides of a suitable depth. The lower plate must, in this case, be made twice as long as the heat chamber, and the furnace must descend from its middle part. The lower plate may be made to traverse backward and forward by means of a rack and pinion on its lower side. Any required number of openings may be made in the upper plate, for cooking utensils, or other purposes.

What I claim as my invention, and for which I ask a patent, is the constructing of a cooking stove, evaporating furnace, or other apparatus, for the management and distribution of heat, upon the principle herein set forth; that is to say, in which the plate to which the furnace is attached, has a revolving or a sliding motion, allowing it to be shifted from one part to another of the heat chamber, whilst the heated air is directed in its course by valves, or dampers; or confined by them within any required limits; whether the same be effected exactly in the way herein described, or in any other operating upon the same principle, and producing similar results.

Elisha D. Payne.

Specification of a patent for improvements in the Apparatus for Spinning Cotton, or other Fibrous Substances. Granted to Asael L. Lanpher, *Killingly, Windham county, Connecticut, March* 19, 1834.

To all whom it may concern, be it known, that I, Asael L. Lanpher, of Killingly, in the county of Windham, and state of Connecticut, have invented an improvement on the apparatus for spinning cotton and other fibrous substances, which is intended as an improvement on the machinery patented by John Thorp, in which he applied the hook and ring to that purpose, and I do hereby declare that the following is a full and exact description thereof.

I make the rings, usually, of wrought iron, and case harden them, or of steel. A ring three and a half inches in diameter, I find most suitable for making twisted roving; two grooves turned near its top edge, one on the outside, and the other within, serve to retain the traveller in its place; they may be one-eighth of an inch in depth. The traveller may be made of iron or steel wire, and should be hardened. The wire may be cut into lengths of about three-fourths of an inch, and so bent that the ends shall be about three-sixteenths of an inch apart. To introduce the traveller, the upper edge of the ring is notched through, a piece being fitted in, which is fastened by a pin when the traveller is in its place.

The ring is sustained in its place, with the spindle in its centre, by

means of three or more small friction wheels, the edges of which pass into a groove turned near its lower side; and it is made to revolve by a band working in another groove, intermediate between the two named. The spindles rise and fall within it in the usual way.

Instead of a mere guide wire between the spindle and the front rollers, I place a tube of about two inches in length, and half an inch in diameter; this tube has a hole of about one-fourth of an inch in diameter, leading from its upper, nearly to its lower end, where it turns, and comes out at the side. A piece of iron or steel projects from the lower end, in a line with the axis of the tube, the extremity of this piece being bent in the manner of the end of a common flier, or otherwise so formed as to embrace the thread. The object of this is to hold and guide the roving, or thread, after it passes through the tube, in order to throw the twist up towards the front rollers, and thus give the roving strength, that it may bear a high speed. The tubes have whirls on them, and may be driven by a band from the cylinder or pulley placed at the end of the frame, or otherwise.

I start the ring with the spindle, in order to prevent the breaking down of the roving after doffing; and as the bobbins increase in size, the traveller increases its movement, giving a gradual draft; and in order to give an uniform twist to the roving, from end to end, I graduate it by accelerating the motion of the rollers as the bobbins fill, or I decrease the speed of the spindles.

In operating with this improved apparatus, the tube is driven at any speed that is required to run in a twist up to the point where the roping comes through the rollers, that it may be strengthened where it is most liable to break.

The twist comes out as it leaves the end of the flier-formed projection, and whatever may be requisite is given by running the ring and the spindle at the relative velocities which may be necessary to accomplish this end; a point which every machinist can easily regulate.

What I claim as my invention, and improvement, is the tube, or counter-flier, applied upon the principle herein set forth, for the purpose of making twisted and condensed rovings. I also claim the manner of fixing the ring, and keeping it in its place by friction wheels; and the general combination and arrangement of the parts described, in order to attain the ends proposed. Not intending to limit myself to the dimensions given, or to the precise mode of constructing the respective parts, but to vary the same as I may think proper, whilst I accomplish the same object by analogous means.

ASAEL L. LANPHER.

Description of an improvement in the art of fastening together the Planks or Boards of a Vessel's or Boat's Bottom, Sides, or Deck; for which a patent was granted to THOMAS BLANCHARD, *city of New York, March* 20, 1834.

After laying the keel, and fixing the stem and stern posts, rods or bars of metal are placed upon the top of the keel, and fastened to it

by their middles, their ends being bent up in the form of ribs to the boat intended to be built, their ends reaching up a little higher than the place of the gunwale. The rods are perfectly secured in their places by the keelson, which crosses the whole of them. The rods are to be slightly attached to a spiling at their upper ends, to confine them so as to give the proper form of the boat.

The planks are to be cut and fitted in the usual way, but so as to form perfect joints, and are placed against the outside of said rods, which may be imbedded in, or merely rest against, them. Near each edge of each plank is firmly attached a clamp, passing over the rods; these clamps may be made of hoop iron, or otherwise. All the planks are thus fixed excepting those for the wales, which, being thicker than the others, are to be bored through to receive the rounded and tapped ends of the metallic ribs, which have screw nuts, the tightening of which upon the gunwale, will draw all the planks together, in the most perfect manner. Dowel pins may be employed in the edges of the plank to prevent slipping.

Thwarts are placed at the usual height, and properly fitted and supported by cleets. Under each thwart a metallic rod crosses the boat, passing through its sides, and serving to draw them close to the thwarts, and thus to prevent all danger of spreading.

The mode of securing the deck by similar means, and of fixing diagonal or other braces, are fully explained, but these not affecting the general principle, we do not deem it necessary to particularize. It is manifest that futtocks, knees, and other known modes of giving stability, may be added to the particular device of the patentee.

When the planks are sufficiently thick, they may be bored through edgewise, and the rods passed through them; or the rods, flattened, may be passed around the plank on the outside, instead of within, in either of which cases the clamps, above spoken of, will be dispensed with. Elastic wood may also be substituted for the metal rods, and made to act upon the same principle with them.

"The principle of this improvement consists in the simultaneous action and continued force of mechanical means upon the edges of the planks or boards of a ship's, or vessel's, or boat's bottom, and sides, and deck as aforesaid, the edges of said planks or boards being cut to the form or curvature intended, so that the mechanical force used will act fairly and equally on the surface of said edges, and on the planks or boards, to press the edges closely together, and draw the planks or boards inwards by the same operation, substantially in the mode herein first above described, in respect to the fastening of the bottom and sides, and decks of vessels respectively."

We will not dismiss this description without saying that the plan appears to us to be not only a real, but a great improvement in the fastening the planking of vessels, but particularly of boats and others of the former class, for which it appears to be specially intended.

Specification of a patent for an improvement in Lamps. Granted to Jacob Keim, *city of Philadelphia, March* 29, 1834.

To all whom it may concern, be it known, that I, Jacob Keim, of the city of Philadelphia, in the state of Pennsylvania, have invented an improvement in lamps, and that the following is a full and exact description thereof.

The lamp in which my improvements are applied is of that kind which has a circular wick, with a glass chimney, or Argand's burner; and it may be either suspended, or fixed upon a stand; the reservoir for oil is to be constructed in the same manner as is usual in lamps of that description, the improvements consisting principally in the formation and arrangement of the tubes for containing the wick, and supplying air thereto; the latter of which objects is effected by currents from the bottom, through the body of the lamp, not only for that portion which is required on the inside, but also for that which is necessary on the outside of the flame. The drip-cup screws on in the usual way, and is perforated with holes, to supply air through the inner, or spiral tube. On the outside of the concentric tubes which contain the wick and the runner, there is another tube extending through the body of the lamp, from the top to the bottom, and open at both ends; and through this the air is supplied to the outside of the flame, a circular space of three-sixteenths of an inch, more or less, being left for that purpose. The lower end of this tube is firmly soldered to the body of the reservoir, the oil from which has a passage into the space between the tube forming the chamber for the wick, through two or three small tubes leading from one to the other, and situated as near as may be to the lower end thereof; these small tubes serve also to sustain those forming the chamber for the wick, in their places, no other stays or supports being necessary.

The runner, or loose tube which surrounds the wick, and which has a slot in it for guiding the wick holder, in the usual way, I line, or cover, with flannel, or some other kind of cloth; this I usually fasten thereto by sewing it through holes drilled in the runner for that purpose. When it is to be sewed on the inside, the tube forming the runner must, of course, be made sufficiently large to admit it without its interfering with the raising of the wick. This lining, or covering, is to extend the whole length of the runner; its use is to serve not only as a filterer of the oil as it rises to the wick, but principally, by its capillary attraction, to carry this fluid up to the wick when the latter is high up in its chamber, and the former low in its reservoir; a purpose which it answers so effectually that the whole of the oil may be burnt, although it may be far below the level of the wick.

By this arrangement I am enabled to elevate the upper edge of the wick considerably above the body of the lamp, and thereby to lessen its shadow to a considerable extent.

An opening may be made in the upper part of the reservoir, for supplying it with oil; but instead of this I generally give to it a cylindrical form, the cylindrical part rising to the height of an inch, more or less, above the body of the reservoir, and terminating on the same level with the tubes which form the passage for air to the outside of

the flame, and at such distance therefrom as to leave a space between it and the outer of these tubes, of sufficient width to pour in the oil.

The glass holder, which also raises the wick, has perforations on its upper surface, just over the outer air tube, to feed the flame.

What I claim as my invention, and for which I ask a patent, is the general construction and arrangement of the parts of the within described lamp, for the purposes herein set forth, and especially for that of giving a clear and continuous supply of oil to the wick. The reservoir for the oil, the spiral tube for raising the wick, the wick holder, and the drip-cup, being common to this and to many other lamps, make no part of my invention or improvement, but in all other respects I consider this lamp as essentially new, inasmuch as by the combination of its parts, as described, new and useful effects are produced.

JACOB KEIM.

Specification of a patent for Stoves for Cooking and other purposes. Granted to JOHN HARRIMAN, *of Haverill, Essex county, Massachusetts, March* 31, 1834.

To all whom it may concern, be it known, that I, John Harriman, of Haverill, in the county of Essex, and state of Massachusetts, have invented certain improvements in the manner of constructing stoves for cooking and for other purposes, and that the following is a full and exact description thereof.

The principal part of the body of this stove is to be made of cast iron. The bottom plate forms the lap, the bottom of the fireplace, and of an oven situated behind it. The fireplace is like that in many other stoves, being a deep opening, and having double doors in front, which may be closed when requisite. In the upper plate of the fireplace I usually make three perforations for the reception of cooking utensils, the middle one large, and furnished with concentric circular rings of different sizes to adapt it to different kinds of vessels. Near to the back end of this plate I make two other openings, which may be either round or oval; and to give sufficient room for these I swell out the said top plate, and also the side plates of the fireplace, giving to it a curved form which is at the same time both ornamental and convenient. There may, if desired, be other openings in the top, but these are all that I deem essential.

The oven is situated behind the fireplace, and is in the form of a rectangular box, one side of which is against the back of the stove. The oven has a door, or doors, at one end, and it is formed with outer plates of cast iron, and inner plates of sheet iron. This latter part is made in a separate and distinct box, so that it can be drawn out whenever it requires to be repaired, or renewed. It is made so much smaller than the outer box as to admit a space between the top, bottom, and sides, through which the heated air and smoke are to pass in their passage to the pipe. These escape from the fire through a throat, or opening in the upper part of the stove back, and then pass down, and under the oven, thence ascending to the top, where there is an opening for a stove pipe. This opening is surrounded by a partition

on the top of the oven, to prevent the heated air from passing over it, without going down and around it; in this partition there are valves which may be opened when it is wished to direct any part of the current over the oven. I intend sometimes to cover the top of the inner portion of the oven with a cast iron plate, should the intensity of the heat render it necessary.

Instead of making round openings directly through the top plate of the oven, for receiving cooking apparatus, I make a rectangular opening, the length of which may be twice as great as its width, and adapt stew pans, frying pans, &c. to this opening. The plate which is to cover it when not wanted to be entirely open, I perforate so as to receive smaller cooking vessels, when required.

By this arrangement, boiling water for washing, for cooking meat by boiling, as well as roasting, baking, frying, and broiling, may all be carried on together, or any desired number of them may be performed separately.

What I claim as my invention, and wish to secure by letters patent, is the form given to the body of the stove for the purpose of receiving the two smaller openings for vessels near its back and two sides; the making the rectangular opening in the outer top plate of the oven in the manner and for the purposes set forth; the making the inner sheet iron oven so as to draw out; and the particular arrangement of the parts, for attaining these ends.

JOHN HARRIMAN.

Specification of a patent for Machinery for Boring and Mortising Hubs for Wheels. Granted to ROBERT M'CARTY, *Martinsburg, Lewis county, New York, March* 31, 1834.

To all whom it may concern, be it known, that I, Robert M'Carty, of the town of Martinsburg, in the county of Lewis, and state of New York, have invented new and useful machinery for boring and mortising hubs for wheels, as well as other articles; for cutting out and dressing the felloes and spokes in the business of manufacturing carriage wheels of all descriptions; and which are applicable to many other branches of business in which similar operations are to be performed; a part of which apparatus also may be applied to the shifting and setting of the logs in saw mills, and for other purposes; and I do hereby declare that the following is a full and exact description thereof.

That part of the machinery which is to perform the boring and mortising has a carriage somewhat like that of a saw mill, but only of such length as is necessary to receive the hub or other article to be operated upon; and this carriage traverses backward and forward, in like manner, upon suitable ways. A frame to rise and fall vertically, like a saw frame, is worked up and down between fender posts, by means of a lever, and a shaft in the middle of this frame, fixed vertically, has a socket in its lower end to receive chisels, or boring bits of various kinds. This shaft may be made to revolve by a band passing round a whirl, when wanted for boring, or may be fixed by a

screw or wedge when used for mortising. The frame and shaft, and also the fender, or guide parts, I usually make of cast iron.

When a hub is to be bored and mortised, it is fixed between two heads attached to the carriage, and held in its place by a screw, or slide, much in the manner of an article to be turned in a lathe. The screw has upon its end a box, or chuck, which receives one end of the hub, and which serves, by means of divisions upon its periphery, to lay out the mortises. This box, or chuck, is hollow, and has within it a spiral spring which is wound up by turning the screw, so that by raising the point which falls into the divisions on the periphery, the tension of the spring will cause the box and hub to turn until the point falls into the next division; the hub, or other article, may thus be bored, and afterwards mortised all round, without the trouble of laying out the mortises. In boring, the bit is regularly brought down by the lever; in mortising, the lever is worked up and down like a pump handle, and by this motion the hub also is moved regularly backwards and forwards under the chisel, until the mortise is completed.

The manner in which the carriage is moved, I will now describe. There is a cam, or projecting piece, on one side of the frame which carries the boring and mortising shaft; which cam operates upon the upper end of a vertical lever, working upon a pin, or fulcrum, which passes through it into one of the fender posts. This lever acts upon two ratchets, one attached to it above, and the other below its fulcrum, which operate upon ratchet, or rag wheels, at opposite sides of the fender posts, something like the feed hand of a saw mill; these being alternately brought into operation, serve to reverse the motion of the carriage, which is driven by means of pinions upon their axes, that take into racks upon the carriage. The carriage, by means of cams, or lifters, raises one of these ratchets, and depresses the other, at the required point. The parts by which this is effected may be variously arranged; that, however, which I prefer, is represented in the drawing deposited in the patent office, and is explained by the written references thereunto annexed.

One of the chisels which I use for mortising is a square socket chisel, with four cutting sides, the chips passing up through the inside or socket part of it, and being delivered at an opening, or throat, on one side. The two sides which head the mortise have cutting edges at their angles which descend below the general edge; and the socket part enlarges above the bevil of the chisel, to free and hold the chips as they pass up.

For tenoning the spokes, I use a double chisel, cutting the sides and shoulders at one operation, one part of the cutting edge of each being at right angles to the other. These chisels are screwed, or otherwise fastened together, so that their distances from each other may be altered to suit the thickness of the tenon. The combined chisels fit by their shanks into the socket before alluded to.

To get out and to dress the felloes, I employ a cast iron wheel revolving on a mandril, or shaft, fixed in its centre, on the opposite side of which I place cutters, upon sliding arms, which may be set to the proper radius, and distance apart, for wheels of different sizes,

and felloes of different widths. Such a table, when not too large, may be fitted into, and revolve with, the shaft of the machine, with the cutters on its under side; or it may be fixed in a separate frame. To an arm on the same table I affix a plane which dresses the sides of the felloes. Instead of a wheel, arms extending out may answer the same purpose.

What I claim as my invention is the particular construction of the square socket chisel for mortising; the adjustable chisels for tenoning; the application of the spring in the index head, for shifting the hub; and the general arrangement of the whole machine as described, to effect the purposes herein set forth.

ROBERT M'CARTY.

ON THE MANUFACTURE OF VARNISHES.

(Continued from p. 215.)

Japanners' Gold Size.

It is most proper to make gold size in iron pots, as, from the great heat and the quantity of driers required, copper pots are too thin and ductile; they would soon become quite burned at the bottom. Therefore, to make forty gallons of gold size, put ten gallons of oil into the set iron pot, Fig. 1, make a good fire under it, and boil it for two hours; then introduce seven pounds of dry red lead, seven pounds of litharge, and three pounds of copperas, by sprinkling in a little at a time; let the oil keep boiling all the time, not in too great a heat, or it will perhaps run over. During the time of putting in the driers, keep stirring them from the bottom of the pot; for should they settle in a mass, before the oil has gradually taken them up, it will darken the gold size; therefore, keep constantly stirring, and have the large iron ladle ready to cool it down, if it should appear to rise too high; have also at hand an empty pot—the copper boiling pot will do—into which immediately lade part of the boiling oil, if it cannot otherwise be kept in the pot, while the assistant is either choking or damping the fire with wet sifted ashes, of which there always ought to be a wheelbarrowful at hand, in case of an accident; but of which there need not be any fear, if due precaution is observed. It is better to be a little under the heat than above it, particularly by those who are not experienced makers; it will only require a little longer boiling, to make up for the deficiency of heat. When the oil has boiled about three hours from the beginning, and the driers are all in, fuse in the gum-pot ten pounds of gum anime; and during the time of fusing, heat two gallons of raw linseed oil in the copper pouring jack, by placing it on the plate of the gum furnace. After the oil has been poured to the gum, and as soon as, on examination, it appears boiled clear, take the gum-pot from the fire; let it cool for a few minutes, then pour it into the oil in the set-pot. Wash out the gum-pot, and proceed with another run in the same way.

When both runs of gum are in the set-pot, there are altogether fourteen gallons of oil, twenty pounds of gum, and seventeen pounds

of driers; increase and keep up a regular fire in the front of the furnace, that it may be drawn out in a moment, if it should be necessary. The gold size will soon throw up a frothy head on the surface, which must be kept down by constantly plying with the ladle when it is likely to rise within four inches of the pot edge. In about five hours from the beginning of the oil boiling, it will become stringy; but the boiling must continue until it hangs to the ladle, appears quite stringy, yet drops in lumps. When tried upon the glass, if it feels sticky and strings strongly, then it is boiled enough. Draw out the fire, sprinkle it with plenty of water; leave not a spark of fire in the varnish house—not even a lighted pipe of tobacco. While the maker is cooling down the pot, let the assistant have ready at the door thirty gallons of turpentine, fill the pouring-pot ready, and have all the doors open. Endeavour to cool it as fast as possible, as it will require at the least one hour and a quarter after the fire has been put out before it will be ready to mix, because the pot being iron, and very thick, and set in bricks, causes the gold size to hold heat a long time, therefore it is difficult to describe exactly at what time to mix the turpentine; for, observe, that if the oil and gum are not sufficiently boiled, the gold size will perhaps not dry quick enough; and if they should, on the other hand, be too strongly boiled before they are cold enough to mix, even though the fire be out, they may become what is termed coagulated or slimy, and be so much concentrated that their particles will not open with the turpentine, and the whole becomes completely lost; so that it is better to err on the safe side, and stop the boiling in time. When the mixing commences, continue the pouring without intermission, until all the froth at the surface disappears, never stirring it until the turpentine is all in. If pouring in the turpentine has commenced while it was too hot, there will be a great loss of turpentine by evaporation; but that will not injure the quality of the gold size.

Place the carrying-tin close to the side of the pot, lay on the tin ladle, and strain off as quickly as possible. When all the gold size is out, pour into the set-pot about three gallons of turpentine washings, and, with the swish, wash down the pot as quick as possible; and if the pot is still so hot as to evaporate the turpentine, lade it out into the washings again, and pour in about three gallons of raw linseed oil, and with a palette-knife scrape it all round, washing and cleaning it down with a rag until it is quite cleansed all round; then lade out the oil, and wipe it completely clean and dry. The gold size ought to dry in from fifteen to twenty-five minutes, and in fourteen days it is ready for use. Experienced makers can make gold size that will dry in five minutes, but that requires great practice.

Black Japan, (*the best*,)

Is made after the manner of the gold size. Put six gallons of raw linseed oil into the set-pot; boil it with a very slow fire. Have a ten gallon cast iron pot, with two handles or ears; this pot will fit into the plate of the boiling furnace, Fig. 2; into which put ten pounds of Egyptian asphaltum, and make a good fire in the furnace: it will require a good regular fire all the time of fusion. There ought to be

an iron cover exactly to fit the fusing-pot; and also a pair of pot-hooks for lifting it from the fire; for sometimes, if the pot is thin and the fire too brisk, it requires lifting from the fire a few minutes to moderate the heat. During the time the asphaltum is fusing, have two gallons of oil getting hot to mix it with as soon as it is sufficiently melted. After it is oiled, leave it on the fire about ten minutes; then either lift it by the pot-hooks, and pour it into the set-pot, or otherwise empty it with a ladle; whichever way it is emptied, leave the stones, &c. at the bottom. Carry it out of doors, and with a handful of hay or straw clear it out, and afterwards wash it out with turpentine washings, and dry it with a rag. Proceed and finish three more separate runs like the first, until there are four runs in the set-pot, that is, forty pounds of asphaltum and fourteen gallons of raw linseed oil; then introduce exactly the same driers as for the gold size, and in the same manner. Keep a regular, but moderate fire, so that the boiling continues at a moderate heat for four hours from the last run being poured in the set-pot; then draw, and put out the fire for that day. Next morning, as soon as it can be brought to a boil, try it upon a bit of glass; if it but strings strongly, it will not do: it must be boiled so strong, that when a piece is pinched from off the glass, after it has been left to cool, it will roll in a hard pill between the finger and thumb. When it forms hard, and scarcely sticks to the fingers, it is then boiled enough. Put out the fire, as directed before. Leave it one hour and a half before mixing. When cold enough, mix it with thirty gallons, at least, of turpentine, and strain it. If it is too thick when cold, heat and introduce as much turpentine as will bring it to a proper consistency. The japan will dry in six hours in summer, and eight in winter. It is principally intended for, and used by, coach-makers, japanners, painters, &c., and should be kept at least six months before it is used.

Another Black Japan

Is made by putting into the set-pot forty-eight pounds of Naples, or any other of the foreign asphaltums (except the Egyptian;) as soon as it is melted, pour in ten gallons of raw linseed oil. Keep a moderate fire, and fuse eight pounds of dark gum anime in the gum-pot; mix it with two gallons of hot oil, and pour it into the set-pot. Afterwards fuse ten pounds of dark, or sea, amber, in the ten-gallon iron pot; keep stirring it while fusing; and whenever it appears to be over heated, and rising too high in the pot, lift it from the fire for a few minutes. When it appears completely fused, pour in two gallons of hot oil, and pour it into the set-pot; continue the boiling for three hours longer, and during that time introduce the same quantity of driers as before directed; draw out the fire, and let it remain until morning; then boil it until it rolls hard, as before directed: leave it to cool, and afterwards mix with turpentine. This japan will appear in colour like the other; but when applied on work, it will dry more hard, compact, and glossy, and will not rub down or polish so soon as the other, which is occasioned by the toughness and durability of the amber.

Pale Amber Varnish.

Fuse six pounds of fine picked, very pale transparent amber in the gum-pot, and pour in two gallons of hot clarified oil. Boil it until it strings very strong. Mix with four gallons of turpentine. This will be as fine as body copal, will work very free, and flow well upon any work it is applied to; it becomes very hard, and is the most durable of all varnishes; it is very excellent to mix in copal varnishes, to give them a hard and durable quality. *Observe*, amber varnish will always require a long time before it is ready for polishing.

Best Brunswick Black.

In an iron pot, over a slow fire, boil forty-five pounds of foreign asphaltum for at least six hours, and during the same time boil in another iron pot six gallons of oil which has been previously boiled; during the boiling of the six gallons introduce six pounds of litharge gradually, and boil until it feels stringy between the fingers; then lade or pour it into the pot containing the boiling asphaltum. Let both boil until, upon trial, it will roll into hard pills; then let it cool, and mix it with twenty-five gallons of turpentine, or until it is of a proper consistence.

Iron-work Black.

Put forty-eight pounds of foreign asphaltum into an iron pot, and boil for four hours; during the first two hours introduce seven pounds of red lead, seven pounds of litharge, three pounds of dried copperas, and ten gallons of boiled oil; add one eight-pound run of dark gum, with two gallons of hot oil. After pouring the oil and gum, continue the boiling two hours, or until it will roll into hard pills like japan. When cool, thin it off with thirty gallons of turpentine, or until it is of a proper consistence. This varnish is intended for blacking the iron-work of coaches and other carriages, &c.

A cheap Brunswick Black.

Put twenty-eight pounds of common black pitch, and twenty-eight pounds of common asphaltum made from gas tar, into an iron pot; boil both for eight or ten hours, which will evaporate the gas and moisture; let it stand all night, and early next morning, as soon as it boils, put in eight gallons of boiled oil; then introduce gradually ten pounds of red lead, and ten pounds of litharge, and boil for three hours, or until it will roll very hard. When ready for mixing, introduce twenty gallons, or more, of turpentine, until of a proper consistence. This is intended for engineers, founders, ironmongers, &c.; it will dry in half an hour, or less, if properly boiled.

Another Cheap Brunswick Black.

Put twenty-eight pounds of common pitch and twenty-eight pounds of gas-asphaltum into an iron pot; boil these for eight or nine hours;

leave it until next morning; then bring it to a simmer, and gradually introduce seven pounds of red lead and seven pounds of litharge, and continue it at a low heat while the oil is got ready. Put five gallons of boiled oil into the ten-gallon iron pot, and boil it until it will blaze inside the pot when a lighted paper is held over it. As soon as it will catch fire, carry it out into the yard, put a ladle into the burning oil, and move it gently from the bottom. In about ten minutes from its catching fire, have the iron cover ready, and boldly, but deliberately, step forward and clap on the cover, taking care to fit it so tight to the pot, that it will extinguish the flame in a moment, which if it does not, lift the cover and try a second time, while the assistant throws the carpet over the cover, and holds it close for a minute; if that does not put out the flame, pour in cold boiled oil, of which there ought always to be two gallons in the pouring-jack ready at hand; then it will be easily extinguished by raising the cover. Continue setting it on fire and extinguishing it after the space of three or four minutes, until, when a little is poured into a muscle-shell and cooled, it looks as thick as treacle; it is then strong burnt oil. Before it is cool, lade it into the asphaltum, and boil the whole for two hours, or until it will roll hard. When sufficiently cool, pour in twenty gallons, or more, of turpentine until of a proper consistence. When this is properly managed, it may be made to dry in ten minutes.

Flock Gold Size.

Put twelve gallons of linseed oil into the iron set-pot; as soon as it has boiled two hours, introduce, gradually, twelve pounds of litharge. Continue the boiling very moderately for six hours; let it remain until next morning; then bring it to simmer, and run ten pounds of gum anime and two gallons of oil. When these two runs of gum are poured into the iron pot, put in seven pounds of Burgundy pitch, which soon melt, and continue the boiling, and keep lading it down, as before directed for the best gold size; boil it moderately strong, but not over strong; and when proper, mix it with thirty gallons of turpentine, or more if required; but recollect, this should be left a little thicker and stronger than japanners' gold size. This is intended for, and used by, paper stainers to lay their flock on, and ought to dry slowly in one hour.

Bronzing Gold Size

Is nothing more than japanners' gold size kept till very bright and tough from age, and then heated up and mixed with one gallon of very old carriage varnish to nine gallons of gold size. This is used by paper stainers for laying on bronze and also gold; and likewise by writers, grainers, japanners, gilders, &c.

Recollect, that the greater the proportion of carriage varnish, the slower it will dry. Some paper stainers like it to dry quicker than others; and writers and grainers like it to dry quicker than gilders and japanners.

Axioms observed in the Making of Copal Varnishes.

The more minutely the gum is run, or fused, the greater the quantity, and stronger the produce. The more regular and longer the boiling of the oil and gum together is continued, the more fluid or free the varnish will extend on whatever it is applied. When the mixture of oil and gum is too suddenly brought to string by too strong a heat, the varnish requires more than its just proportion of turpentine to thin it, whereby its oily and gummy quality is reduced, which renders it less durable; neither will it flow so well in laying on. The greater proportion of oil there is used in varnishes, the less they are liable to crack, because the tougher and softer they are. Increase the proportion of gum in varnishes the thicker the stratum, and the firmer they will set solid, and dry quick. When varnishes are quite new made, and must be sent out for use before they are of sufficient age, they must always be left thicker than if they were to be kept the proper age, as some of the annexed experiments will prove.

Exp. I.

Of two well got up pannels, painted with patent yellow, I varnished the first with good body varnish twelve months old, the second pannel was varnished with body of the like quality only one month old. After both pannels were dry, on examining the first it was excellent; but that varnished with the newly made varnish, looked poor, flat and *sleepy*, as it is termed.

Exp. II.

Of two pannels, both prepared and flatted down, the first I varnished with gold size, and the second with japan; both had only been made one month. The gold size dried in half an hour, and the japan in ten hours and twenty minutes. I then put both pannels into an empty drawer, where they remained for eight months. I then tried the same gold size and japan on two fresh pannels, prepared exactly as the first, when I found the gold size much thicker, yet much paler, and it now dried in fourteen minutes; the japan also dried now in seven hours.

Exp. III.

That varnish made from African copal alone, possesses the most elasticity and transparency, may be proved by the following facts. Three prepared pannels of a very pale straw colour, were all varnished in one day: the first with fine body varnish made from very pale gum anime; the second with fine body varnish made from one-half anime and one-half African copal; the third pannel was done with varnish made entirely from fine African copal. These three varnishes were all made with the greatest nicety for the experiment; all equal in their proportions and ages, having been all made in one day. At the time of varnishing the three pannels, the varnishes were all

eight months old. I filled three vials, one with each sort, and could discover no difference in the colour, either when held near to the eye or at a distance. Upon moving the vials, and turning them, the third, containing the African copal, appeared the most elastic. All the three pannels dried about the same time—eight hours. I hung them all three where they were exposed to sun, wind, and rain, for one month. I then examined them, and could perceive little, if any, difference in colour. I left them for another month, when, on examination, the first, made from anime, was the darkest, and that from the copal the palest. I then polished all three; the first polished very easily, the second not quite so easy, and the third was very difficult to polish, appeared very soft and clammy, but when completed was by far the palest and most transparent. I left them upon a roof exposed to the weather for three months, when I flatted them down a little, and varnished them afresh. In ten days after, I polished them, when the third, varnished with the African copal, was by far the palest, and looked like plate-glass.

Exp. IV.—*That too much Driers in Varnish renders it opaque, and unfit for delicate Colours.*

One day I varnished two pannels, got up and glazed with a very rich crimson lake. No. 1 was varnished with body varnish, made entirely from African copal, without any driers whatever, either in the clarified oil, or boiling. No. 2 was varnished with "body" of the same gum, age, and proportion, but with a small quantity of dried sugar of lead and dried white copperas. The pannel No. 1 dried in nine hours, and remained tacky for five hours more; the pannel No. 2 dried in seven hours without a tack. In a day after, both pannels were flatted down and varnished, and repeated until each pannel had four coats of varnish; the varnish was eight months old, and each dried in the same space of time. I hung both up for a month, and then polished them, and examined them with a microscope, when the pannel No. 1 appeared quite clear in colour, solid, and brilliant, like plate-glass; but No. 2 had changed a little in colour, inclining to purple, and in the varnish were almost imperceptible opaque points. I kept these two pannels for two years afterwards; when I examined them, there appeared no decay in No. 1, but in No. 2 the driers were perceptible on the surface with the naked eye.

[TO BE CONTINUED.]

On the Berlin Cast iron Ornaments. By Dr. Freidenberg.

In the Edinburg New Philosophical Journal for April, 1834, we find the following translation of an account of the celebrated cast-iron ornaments manufactured at Berlin, which has been given by Dr. Freidenberg in his German edition of Mr. Babbage's work on the Economy of Machinery and Manufactures.

The Berlin cast iron ornaments may be mentioned as an interesting

example of the increased value of manufactured, in comparison with the raw material; and we select this manufacture the more willingly, as it had its origin in Prussia; and though many attempts at imitation have been made, has never yet been equalled by any other country. In one of the principal manufactories of this description in Berlin, that of Devaranne, such is the fineness and delicacy of those separate arabesques, rosettes, medallions, &c. of which the larger ornaments are composed, that nearly ten thousand go to the pound. The price increases in proportion to the fineness, as will be seen by the following table, which gives the selling prices of the above named manufacturer.

	Number to the cwt.	Price of each article.			Price per cwt. of the same.		
		£	s.	d.	£	s.	d.
1. Buckles, $3\frac{1}{2}$ inches long, and $2\frac{1}{2}$ inches broad,............	2640	0	2	6	330	0	0
2. Neck chains, 18 inches long, and 1 inch broad; and composed of 40 separate pieces,	2310	0	6	0	693	0	0
3. Bracelets, 7 inches long, and 2 inches broad; and composed of 72 pieces,............	2090 pair	0	8	6	888	5	0
4. Diadems, $7\frac{1}{2}$ inches high, and $5\frac{1}{4}$ inches broad,............	1100	0	16	6	907	10	0
5. *Sevigné needles*, $2\frac{1}{2}$ inches long, and $1\frac{1}{2}$ inches broad; and composed of 11 parts,	9020	0	4	6	2029	10	0
6. Sevigné ear-rings, 3 inches long, and $\frac{7}{8}$ of an inch broad; composed of 24 pieces,....	10,450 pair	0	5	3	2743	2	6
7. Shirt Buttons,................	88,440	0	0	8	2948	0	0

If we reckon the price of the gray iron, from which these ornaments are made, at 6s. per cwt. on an average, we find that the value of the material is increased 1100 *times* in the *coarser* articles, and 9827 *times* in the *finest.*

The above are the retail prices, and the wholesale prices are probably one-sixth or one-eighth less: but we must remark, that, compared with the old prices, the present ones are much fallen. About six years ago they were twice as high, and twelve years ago three times; so that at that time Berlin cast-iron was nearly of equal value with gold,—a remarkable example, and perhaps one of the strongest proofs of the influence of the industry of manufacturers on the wealth of the state, especially when we consider that the cast-iron ornaments are made of native material, and exported in large quantities abroad, and even indeed to America. It is so much the more to be regretted, that, owing to the imitation system which already prevails to a great extent, a branch of native industry, once so flourishing, should threaten to fall gradually into decay. The facility of imitation of the most

saleable objects, by purchasing them at a low price, using them as models, and then casting articles of the same description, enables the imitator to offer his goods at such a low price, that the industrious original manufacturer, who has been at the expense of much time and capital in the designing and forming a brass model, finds it impossible to enter into competition with him. On the one hand, therefore, the manufacturer cannot venture to expend much capital on new models which do not repay the outlay, and, on the other, by repeated casting, the articles lose much of their sharpness and beauty, and the natural consequence, (and which is already perceptible) is, that their reputation abroad must sink; and, notwithstanding their moderate prices, the sale must decline. On this account some of the best manufacturers have given up the business, and the task of improving and perfecting this branch of industry, now rests in the hands of a few.

The piracy of locks is regarded as dishonourable, and against the laws; in technical manufactures new discoveries and improvements can be secured by patents; the cast-iron manufacture alone is unprotected, and imitation allowed to be carried on openly and freely.*

Rep. Pat. Inv.

¶ *Description of a Safety Stirrup. By* Samuel Jackson, M. D. *of Northumberland, Penn.*

[Communicated in a Letter to the Editor.]

The business of the practical physician is not merely to prevent or cure diseases, but also to obviate all the casualties to which we are liable in the journey of life; hence, though the present paper may not be quite medical, or pertain, very strictly considered, to the pages of your journal, yet inasmuch as it recommends a means of safety to your numerous readers, most of whom are country practitioners and riders on horseback, it will not, by them at least, be thought out of place. Were I to present them with an effectual preventive or cure of hydrophobia, how great would be their exultation; and yet what we are now recommending might have prevented more death and distress, in this neighbourhood at least, than has ever resulted from rabies canina. Not one case of this disease has been known within a radius of fifty miles from this place, and probably not within a much greater distance, for the last half century, while, within this very vicinity, and within a very few years, the most distressing lacerations, and even death, have been the sad consequences of persons being dragged by the stirrup.

It is generally supposed that the spring stirrup, which opens at the

* We may remark here, that many British manufactures, in which patterns of various kinds are employed, require the protection of the British Legislature as greatly as the cast-iron ornaments of Berlin are stated to need that of the Prussian Government. If we remember right, the manufacture of brass ornaments of every description at Birmingham, may be cited as an example, to which we believe calico-printing may be added.—A. T.

side, affords safety in these cases, and there is an extract from one of my letters in the Medical Recorder, Vol. XI. p. 203, in which it is highly recommended as securing the exit of the foot, let the rider fall in whatever way it is possible. But we have since learned from the actual experiment of falling and hanging by the stirrup, *in propria persona*, that our opinion, so confidently advanced, is utterly erroneous.

After using the stirrup for many years with the most comfortable assurances of safety, I was at last thrown, and my foot was held fast by it, while my head and shoulders rested on the ground. In this dreadful situation, my horse, though young and high-spirited, stood quiet by my side, while with infinite labour and pain, I extricated my foot. I was then told that the rust of the hinge was the cause of its refusing to open, but this was a great error, as was proved by the following decisive experiment.

The hinge was well greased, and made to work with very slight force; I then extended myself on the carpet with my foot in the stirrup, and giving the leather to my servant, I found it absolutely impossible to open it with my foot. The operations were varied in every way in which it was thought possible for a man to fall from his horse, and with the same result. The foot turns quickly round in falling, and hangs by the foot-piece of the stirrup.

I mentioned these things to my talented friend, Mr. Henry W. Snyder, of Selinsgrove, son of the late Governor of Pennsylvania, and he quickly made me a pattern of a stirrup, which I have since procured to be made by George Taber, of Philadelphia. It can be easily understood from the plate. Fig. 1, the entire stirrup. Fig. 2, a side view. Fig. 3, the foot-piece.

Fig. 1.

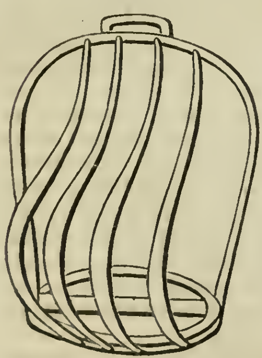
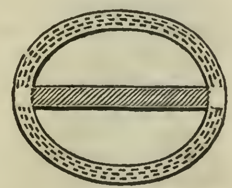


Fig. 2.

Fig. 3.



For an adult, three of the upright or safety irons are sufficient, but as the stirrup may be used by very young persons with small feet, they ought to be very close, and five would be required. These safety bars may be an inch broad. In order to afford him foot-hold, the foot-piece ought to be broad, and the opening in it guarded by a bar inthe transverse diameter, as seen in the plate.

We cannot recommend this as a very handsome part of a horseman's caparison, but it is certainly not very unsightly; and until something better be invented, we beg leave to obtrude it upon the attention of all who would ride without fear of the deplorable consequences of being dragged by the common stirrup. Nearly all the evils attendant on human life are the immediate or remote consequences of neglecting either the moral or physical laws, by which our safety is ensured; and if any one reads this paper without availing himself of this cheap and easily procurable prophylactic, let us refer him for further instruction to one of the best books that ever saw the light—Combe "On the Constitution of Man." "We ought," says this author, "to trace the evil back to its cause, which will uniformly resolve itself into infringement of a natural or moral law; and then endeavour to discover whether this infringement could or could not have been prevented by a due exercise of the physical and mental powers bestowed by the Creator on man."

[*American Journ. of the Med. Sciences*, *Nov.* 1833.

¶ *On Sugar Refining, in France.*

As it is universally known that sirops are injured and decomposed by being too long exposed to an intense heat, various means have been tried to avoid the loss thereby incurred.

The methods which have met with most approbation, are, 1°, the system of evaporating by steam; 2°, the system of evaporating *in vacuo*. Both are decided improvements on the process of evaporating on the naked fire.

But through the agency of steam, the sirops can be granulated only when raised to the temperature of 237° to 240° Fahr., and when heated to that pitch, a material portion of the sirop is still decomposed.

The granulating *in vacuo* is attended with inconveniences of another kind. That system requires a great supply of water, expensive and complicated machinery, very liable to get out of order; besides, the operation takes place in closed and air-tight vessels, and the refiner cannot keep his eye upon it to direct it properly.

Some refiners have tried the use of atmospheric air to facilitate evaporation, but they have been obliged to renounce a scheme which they could not realize.

The art of sugar refining was, then, very far from perfection in France, when an invention, ingenious in its application, great in its results, and remarkable by a success which daily increases, produced a complete revolution in that branch of industry.

A refiner of Lisle, Mr. Brame Chevalier, struck with the idea of using simultaneously steam for raising the sirop to the proper degree of heat, and air, heated by the same steam, to maintain the sirop in a continual agitation, conceived the possibility of obtaining by this means a very rapid, and extensive evaporation, at a very low temperature, thereby preserving the sirop from decomposition, and pro-

curing a great economy of fuel and labour, and also greater returns in sugar.

This very ingenious theory has been most successfully realized. Nothing can be more perfect nor better contrived than the apparatus by which these results have been obtained.

A generator supplies the steam required to work a pump, which drives the air into a cylinder: there the steam heats the air to a proper degree: the heated air is then driven under the false bottom of a boiling pan, heated itself by steam, and escapes by small apertures through the sirop, which it causes to boil immediately. The surplus of steam and heated air is used for warming the stove and store rooms, so that every operation of sugar refining, even that of clarifying, may be made with one boiler and one machine, without the slightest danger of fire.

The boiling takes place in an instant, and as soon as the hot-air cock is opened. Evaporation takes place at 134° Fahr.; granulation is effected in eight minutes, between 178° and 196° Fahr.

Martinique sugars of the fourth quality, worked in this machine, do not produce more than six per cent. treacle, and fourteen per cent. of pale brown sugar, called in France *Vergeoise.*

But great and important as this system is for sugar refiners, it is still more beneficial to sugar manufacturers, who extract the sugar from the beet root or the cane. It is easily conceived, as the saccharine juices, which do not weigh more than *ten* degrees, must be exposed much longer to the fire than the sirops proceeding from the melted sugar, which weigh generally thirty degrees. Moreover, by blowing hot air through the juices, they are purified of any unpleasant taste they may have acquired.

Finally, the advantages which account for the decided preference obtained by the system of Mr. Brame Chevalier, consist in its procuring more and finer sugar from the same quantity of raw materials of the same sort, and, moreover, in manufacturing, with greater rapidity, a superior sort of sugar.

These are positive facts, which are daily proved and verified by the great number of visiters who call at Mr. Brame Chevalier's sugar refinery at Lisle.

[*Lond. Journ.*

Dr. Church's Steam Carriage.

This long projected invention has at length arrived at something like maturity. The carriage, which is fitted up with considerable taste and elegance, was launched for the first time on the public road on the evening of Friday, the 25th ult. Its machinery had never, before that evening, in a connected form, been actuated by the power of steam; and its performance was such as to produce a more promising expectation of realizing the problem of steam propulsion on ordinary roads, than any other effort of the sort that we have heretofore seen.

Our present limits will not allow us to give a detailed account of the machine, but we shall endeavour to do so in our next, accompanied with the specification of the last improvements, which have been adopted in the construction of the boiler, and which have tended very materially to the accomplishment of a perfectly safe and effective locomotive machine.

The boilers, engines, and their appendages, are all enclosed within a square compartment of about eight feet high and long, and five feet wide, which forms the central part before and behind, to which are attached capacious coach bodies, corresponding in appearance, and capable of holding ten persons in each; and connected to these are open cabriolets affording accommodation for eight persons more, making twenty-eight inside passengers. Below are receptacles for luggage, and on the roof accommodation for thirty persons, exclusive of the conductor and guard.

Little is to be expected from a first attempt, but we have much pleasure in saying that a more successful result could not have been anticipated.

After passing heavily laden from the manufactory at Bordesley Green, near Birmingham, through several green lanes recently laid with loose gravel, and performing several acute and difficult turns in the road, this ponderous vehicle proceeded along the Coventry Road with at least fifty persons upon it, at a rate of more than twenty miles per hour for some distance, (perhaps near a mile;) but as it was not designed to carry this experiment further than a mere trial of the capabilities of the machinery, and the means for prolonging the journey not having been provided, we are not in a situation to state such particulars at present as would, perhâps, be necessary to satisfy the inquiries of a practical engineer; but hope to be enabled in our next to give a more detailed account of the performance and construction of the machine, which certainly comprehends several features of considerable novelty and ingenuity, and unquestionably reflects very great credit both upon the ability and perseverance of its talented projector. [*Ibid.*

Air Gun.

It is a curious fact, that although the air pump is a modern invention, yet the air gun, which is so nearly allied to it, in the construction of its valves and condensing syringe, should have existed long antecedent to it; for it is recorded that an air gun was made for Henry the Fourth, by Marin of Liseau, in Normandy, as early as 1408, and another was preserved in the armoury at Schmetau, bearing the date of 1474. The air gun of the present day is, however, very different from that which was formerly made, and which discharged but one bullet after a long and tedious process of condensation, while it now discharges five or six without any visible variation of force, and will even act upon a dozen, though with less effect.

CELESTIAL PHENOMENA, FOR NOVEMBER, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.	Sec.	
9	5	15		Im. 71 τ^3 Aquarii, 5.6, N177° V144°
9	6	4		Em. 244° 226°
12	10	28		N. App. ☽ and 33 Ceti ☽ south 0′, 3
30	2	59	58	*Im. Sun's first limb 260° 0′ 275° 34′
30	3	37	24	†Em. Sun's second limb 71° 17′ 111° 32′

Meteorological Observations for August, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	63°	80°	29.85	29.85	NW.	Calm.		Clear day.
	2	64	82	.85	.90	NE.	do.		Cloudy—lightly cloudy.
	3	68	83	.90	.95	W.	do.		Clear—lightly cloudy.
	4	67	86	.95	.95	W.	do.		Fog—clear.
	5	72	90	.95	.95	W.	do.		Clear day.
⊗	6	71	89	.85	.80	W.	do.		Clear day.
	7	68	90	.85	.80	W.	do.		Clear day.
	8	72	90	.75	.70	W.	Breeze.		Clear day.
	9	68	89	.70	.70	W.	do.	0.80	Clear day—rain in night.
	10	70	88	.70	.75	SE.	do.	0.03	Cloudy—clear—rain in night.
	11	72	88	.75	.75	W.	do	0.04	Cloudy—clear—shower.
	12	72	90	.80	.80	W.	do.		Clear day.
☾	13	72	90	.85	.85	W.	do.		Clear day.
	14	76	88	.85	.85	W.	do.		Cloudy—lightly cloudy.
	15	69	79	.70	.65	NW.	Brisk.		Clear day.
	16	62	79	.80	.80	NW.	do.		Clear—lightly cloudy.
	17	64	76	30.00	30.00	W.	do.		Cloudy—clear.
	18	69	84	29.89	29.75	W.	do.		Cloudy—clear.
	19	59	76	.80	.80	W.	Moderate.		Clear—flying clouds.
☺	20	59	77	.80	.80	W.	do.		Clear day.
	21	60	80	.80	.80	E. W.	do.		Clear—flying clouds.
	22	62	81	85	.85	NW.	do.		Clear day.
	23	62	82	.85	.85	W.	do.		Clear day.
	24	64	84	.85	.85	W.	do.		Clear day—rain in night—thun-
	25	60	75	.90	.90	NW.	do.	0.04	Clear day [der & lightning
	26	57	74	.90	.90	NE.	do.		Cloudy—flying clouds.
	27	60	76	.80	.80	NE.	do.		Cloudy—clear.
☽	28	52	74	.90	30.00	W.	do.		Clear day.
	29	56	75	30.05	.05	NE.	do.		Cloudy—clear.
	30	57	74	.05	.05	NE.	do.		Cloudy day.
	31	62	74	.00	.00	NE.	do.		Cloudy—lightly cloudy
	Mean	64.93	82 03	29.85	29.85			.91	

	Thermometer.	Barometer.
Maximum height during the month,	90. on 5th, 7, 8, 12 13.	30.05 on 29th & 30th.
Minimum do.	52. on 28th.	29 65 on 15th.
Mean do.	73.48	29.85

* For irradiation and inflexion add 9s.2.

† For irradiation and inflexion subtract 8s.8.

JOURNAL

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State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

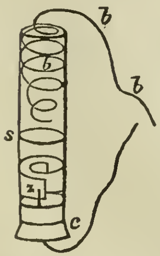
AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

NOVEMBER, 1834.

*An account of some experiments made to determine the most eligible construction of galvanic batteries of four elements.** *By* John W. Draper, *Christiansville, Mecklenburg county, Va.*

My first intention in constructing a galvanic battery of four elements, was to combine the power of batteries of the old construction, with an additional quantity of electricity, developed during the diffusion of liquids, into each other. Encouraged by the extraordinary power of some of these arrangements, I have attempted to ascertain under what circumstances their action is the greatest.



I took a glass tube, six-tenths of an inch in diameter, and three inches long, and closed its lower extremity with a perforated cork, (*c.*) I then took a piece of thin sheet zinc, seven-eighths of an inch broad, and one-half long, (*z*,) and having coiled it into a small spiral, soldered a copper wire, about three inches long, to it. I passed the wire through the perforated cork, in the tube, and made all water tight, with sealing wax. I took a copper wire, (*b*) six inches long, of the thickness that is used for hanging bells, and coiled two and a half inches of it into a spiral, of sufficient diameter to go with friction into the glass tube, as at *b*. Then, pouring a solution of

* See the number of this Journal for Sept., p. 163.—Com. Pub.

chloride of sodium into the tube, as high as *s*, so as to cover the zinc to the depth of half an inch, I filled the remainder of the tube with dilute muriatic acid.

Things being in this state, there appeared to be no chemical action going on in the apparatus, but on joining the free extremities of the copper wires, hydrogen gas, after a few seconds, made its appearance on the copper spiral, and in the course of thirty seconds, the whole length of the spiral was actively disengaging gas. Its nature was determined, by pouring out a little liquid from the top of the tube, and then applying a taper,—frequent explosions immediately ensued.

On making the polar extremities communicate in a tube of acidulated water, the water was immediately decomposed; hydrogen being evolved from the zinc extremity of the apparatus, and the other wire rapidly oxidizing.

To effect the decomposition of water with a single pair of plates, is a novel fact, (Faraday Chem. Manip. § 978,) it is therefore deserving investigation, what arrangement will perform this in the most efficient manner. The following tabular view of a mass of experiments I have made, led me to construct these batteries in the manner hereafter described. The numbers were determined by the torsion of a glass fibre.

TABLE I.—*Respecting the changes of the electrical current in point of* QUANTITY, *at certain intervals of* TIME.

Tube filled with—	Instant of immersion.		2 mins.	5 mins.	10 mins.
1. Dilute sulphuric acid, specific gravity 1037. Obs.—Gas disengaged from zinc; none, from copper.	Ex's. 1	111	97	80	Uncertain, owing to the disengagement of gas from the zinc, which kept the needles vibrating.
	2	110	95	"	
	3	100	97	"	
2. Solution chloride sodium, sp. gr. 1203. Obs.—no evolution of gas.	1	32	10	7	
	2	32	10½	"	
3. Solution of salt, sp. gr. 1203, in contact with zinc—sulph. acid, sp. gr. 1037, in contact with copper. Obs.—Hyd. gas, from copper; none, from the zinc.	1	217	no sensible change.	212	do.
	2	230		210	do.
	3	223		210	do.
4. The same well mixed by shaking the tube. Obs.—Zinc disengages hydrogen.	1	123	117	Very dubious, owing to the disengagement of hydrogen, protecting the copper spiral.	

This table shows that at the very first moment of immersion, a wave of electricity flows along the wire, and that immediately afterwards the action of the battery moderates. It likewise shows that the relative power of a battery of four elements being repre-

sented by 223, the same plates charged with dilute sulphuric acid, would only be 111, and with muriate of soda, 32.

TABLE II.—*Respecting the distances of the zinc and copper plates, in the battery with four elements. Charged with sulphuric acid, specific gravity* 1037, *and muriate of soda, specific gravity* 1203, *in experiment* 1, *but* 1145 *and* 1263 *in experiment* 2.

Expt. 1	72	135	185	200	210	221	0
2	78	143	220	257	280	287	0
	2 ins.	1 in.	½	¼	⅛	1-16	touching

This table shows, that the most energetic action on the galvanometer takes place when the plates are the nearest to each other without touching.

TABLE III.—*Respecting the specific gravities of the two liquids.*

Specific gravity of the muriate of soda, 1203.	Sp. gr. of the other element.	Torsion.	Remarks.
Muriate of soda & water,	1000	3	zinc gives off hyd'gen.
Mur. soda & suph. acid,	1037	176	copper gives off hyd.
	1071	191	
	1088	213	
	1115	234	
	1150	246	
	1200	doubtful.	
Mixed together by shaking the tube,	1037	102	

This table shows, that as the two liquids approach each other in specific gravity, the activity of the battery is more marked. Two theoretical reasons might be assumed: 1st. The chemical action on the metals is more energetic: 2nd, The infiltration of the liquids is more rapid. It likewise shows, as well as table 1st, that when the infiltration ceases, or the liquids are mechanically mixed, much power is lost.

TABLE III.—*Respecting the chemical nature of the liquids.*

Obs.—Every caution was used in these experiments to make them under similar circumstances, as to distance of the metals, time, &c. &c. The plates were well washed after each trial.

Sol. chloride of sodium by itself, (s. g. 1203.)	Nitric acid & copper, satura. carb. soda & zinc.	Sulph. ac. 1037, & cop., sulph. zinc. satu. & zinc.	Sulph. ac. 1037, & cop. phosp. soda saturat. & zinc.
49	135.166.185.200 The numbers increased as the acid was made stronger.	30	40

Nitric acid 1037, & cop. satu. nitrate amm. & zinc.	Solu. chlorine sat. and cop. chloride sodium 1203, and zinc.	
141	47	

Beside these, I made trial of a great variety of other substances, the general result being, that for purposes of experiment, a solution of common salt, not quite saturated, and dilute sulphuric, or muriatic, or nitric acids, are the most eligible fluids. The nearer they approach the saline solution, in specific gravity, the more energetic is their action,--but then it is more transient.

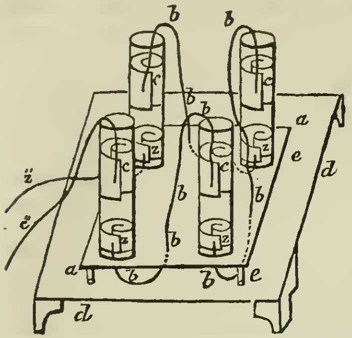
All these numbers were determined, as has been said, by means of a glass fibre, twisted by a Lebailly galvanometer. In the course of these experiments, I had frequent occasion to observe several very perplexing facts, such as a rapid decomposition of water by the polar wires, when after pouring out the solution of salt and sulphuric acid, the tube was filled entirely with a dilute solution of the latter, and yet the galvanometer needle scarcely moved. Again, when there was an extensive movement of the needles, no decomposition ensued. It is a true remark, that the galvanometer needle is no measurer of the decomposing power of a battery. On one occasion, the fluids being nitric acid diluted, and a saturated solution of carbonate of soda, the decomposition of a drop of dilute sulphuric acid, placed between the polar wires, exceeded any thing of the kind I have ever been witness to, and approached, in the opinion of those who saw it, the action of a battery of twenty-three pairs of two inch plates.

By using proper precautions, I have succeeded in decomposing acidulated water, by means of a common arrangement of sulphuric acid in a plate of zinc one-tenth of a square inch, and a plate of copper rather more than double that size. The same plates arranged with four elements, decomposed it with much rapidity.

Table IV.--*Respecting the metals.*

2 plates of platinum, with polar wires of the same,	8	1 of copper, 1 of iron,	cop. pole wires.	197
2 plates of copper, with polar wires of the same,	87	1 of copper, 1 of tin,	do. do.	180
1 plate copper, 1 " zinc, cop. pol. wir's	222	1 of copper, 1 of lead,	do. do.	184

It appears, therefore, that zinc and copper are the most suitable metals of those yet tried. The action of two plates of copper is singular, but might have been predicted; that of two plates of platinum is unaccountable. If there be no electricity developed, by the chemical action of these liquids on that metal, there is no known reason why a current should pass from them, during infiltration, to one plate rather than the other. It is to be presumed, therefore, that in this case, there was some difference in the surface of the platinum plates, which altered their power of conductibility; they were, however, cut from the same piece of foil. In the case of copper and zinc, the the maximum effect took place, when the copper had four times the surface of the zinc,—in the case of the common battery, it takes place when the surfaces are 7.25 to 1.



It now remains to exhibit the most eligible construction of the battery of four elements, according to these data.

The figure represents a battery of four pairs of plates, coiled into spiral cylinders, half an inch in diameter, and an inch high for the copper, but only one-quarter of an inch high for the zinc plate. The glass tubes in which these plates are to be arranged, are firmly imbedded at one end in a piece of wood, (*a a*,) which is thickly coated all over with sealing wax, that serves both to imbed the tubes immovably, and to insulate them thoroughly. To each zinc plate, a copper wire (*b b*,) is soldered, which, when the zinc is placed at the bottom of a glass tube, passes water-tight through the waxed wood, and is bent upwards as at *b b b b;* it communicates with the copper in the next tube, by a soundly soldered joint. In this manner all the copper and zinc pieces are connected together by wires, one end of the wire being soldered to the zinc plate, in the bottom of the tube, and the other end to the copper in the top of the next tube. The first copper and the last zinc, are to be joined together by a wire much longer than any other, (about eighteen inches,) and when the battery is finished, this wire is to be cut in two in the middle, and the two loose extremities, c'' z'', serve as poles.

The copper plates are to be lowered into the glass tubes, (which should be rather more than sufficiently large to receive them,) until they reach within one-sixteenth of an inch of the upper edge of the zinc plates. The piece of waxed wood is then to have four glass pillars (*e e e*,) fixed to its corners. These will support it on a suitable mahogany stand, *d d.*

When the battery is to be used, a solution of salt, nearly saturated, is to be poured into each tube, until it reaches the lower edge of the copper. The remainder of the tube is to be filled with dilute sulphuric acid, of less specific gravity.

A battery of four such plates, is equal to the decomposition of water with great rapidity. It will perform Davy's experiments of the transfer of chemical substances. A visible spark is emitted from charcoal points, and the end of a sewing needle may be made red hot, so as to blue the steel for some distance.

I have constructed a battery of forty-two such plates, which gave the following results: immediately after charging the battery, on moistening the fingers, and touching the polar wires, a very unpleasant shock was received, which passed across the breast. A fine iron wire, lowered on the surface of some mercury, caught fire, and was burnt. The reduction of potash, and all kinds of chemical decompositions, were made with much energy, and mercury was raised in a capillary tube one-eighth of an inch.

The following are some empirical remarks on electrical decomposition,* which may be serviceable to those who make such experiments: they are not rigidly exact, but are useful.

Processes of metallic reduction, by the galvanic battery, are usually conducted in one of these three modes: 1st, the substance to be decomposed is presented in solution with water, as in the case of sulphate of copper, or nitrate of silver: 2nd, it is only moistened with that fluid, as when potassa is acted upon: 3d, it is presented in a liquid form, by the assistance of heat, as in Davy's experiment with the carbonate of lithia.

At temperatures between 40° and 128° Fahr., compound substances, not containing oxygen as one of their elements, are non-conductors of galvanic electricity.

At these temperatures, all the simple bodies are either very good or very bad conductors, and in general, the greater the number of substances existing together in one chemical compound, the more readily is that compound decomposed. Usually, there is no action on solids.

When metallic salts are presented to the galvanic battery for decomposition, in solution with an excess of water, if the power of the battery be in proportion to the strength of the solution, no hydrogen gas is given out at the negative pole, provided the revived metal can exist in water, as copper, silver, &c. If it cannot exist in water, then so soon as an equivalent of it is revived, decomposition of the water ensues, and hydrogen is liberated,—this happens with such metals as potassium and sodium. That a real decomposition of the oxide has happened, is evident by electrifying mercury in contact with a solution of muriate of soda; chlorine is evolved from one pole, and the hydrogen with which it was before united, forms water with the oxygen of the sodium. In this case, the mercury acts as a kind of endless valve, for from the intense affinity which it possesses for the sodium, it instantly allows it to penetrate and be diffused through every part of it; but by excluding the water of the solution, no reaction can take place on the sodium, save only on that which exists nearly at the surface of the amalgam. Between the extremes of good and bad conductors, there is a class of metals, which, in a very comminuted state, decompose water at common temperatures, although they cannot effect it when in mass—as manganese and iron. From solutions, no metals can be revived by the battery, which is not reducible by means of hydrogen gas, below a red heat; and in all these cases, this view may in general be taken, that the electrical decomposition of an oxide, is in reality produced by nascent hydrogen. If peroxide of iron be exposed to a current of hydrogen, at very low temperatures, decomposition ensues, water is formed, and a black cinerous substance is left, which, although it is a non-conductor, is pure iron. In this state, iron will sometimes inflame at temperatures below 100° Fahr. Now the same happens when a saturated solution of proto-sulphate of iron is decomposed by electricity. We may suppose that the hydrogen which would be liberated from the negative pole, whilst its equivalent of oxygen is liberated

* Our correspondent has not even yet seen the results developed recently by Mr. Faraday.—Com. Pub.

from the positive pole, is entirely employed in reducing the protoxide of iron, and the more violent the galvanic action, the more comminuted will be the metallic matter produced, and in this form, even at low temperatures, iron has the power of decomposing water.

When the substance to be decomposed is merely moistened with water, we still bring the reducing agency of hydrogen into play. Hydrate of potassa is a non-conductor, but when a new compound of it is formed with water, that compound is not only a conductor of electricity, but is more readily decomposed. The first point is to dissolve the surface of the hydrate in the smallest possible quantity of water, so as to give it a conducting power; the action produced by the apparatus melts the hydrate; an equivalent of oxygen is given off from the water, and the corresponding equivalent of hydrogen unites with the oxygen of the potash, the metal being revived. The case is exactly the same, when hydrate of potash is decomposed by iron in a gun barrel. At a white heat, the iron unites with the oxygen of the water of the hydrate, and the nascent hydrogen at these temperatures, separates the oxygen from the potassium, the water thus produced being simultaneously decomposed by the iron. The facility of this decomposition, is doubtless owing very much to the volatility of potassium, and the fixity of the oxide of iron, but we may be certain that hydrogen is the main cause of it, for oxide of potassium is decomposed in like manner at a white heat. Gay Lussac has shown, that the reason hydrogen will not decompose hydrate of potash, is owing to the water of the hydrate, which must be decomposed, before any action on the oxide can be produced.

At temperatures between 40° and 120° Fahr., no decomposition can be effected by the voltaic battery, if hydrogen gas is not presented in a nascent state, and as at these same temperatures no compound substance is a conductor, which does not contain oxygen, water must always be present in all galvanic arrangements for decomposition, at those temperatures. But at upwards of 300° Fahr. we meet with many fluids of such conducting power, that without the presence either of hydrogen or oxygen, the mere power of the battery suffices for their complete decomposition, as is the case with liquid iodide of potassium, and chloride of sodium.

Every experiment of reduction, which is effected by the galvanic battery, at temperatures from 40° to 120° Fahr., may be likewise performed by chemical agency, when hydrogen gas is employed, and evolved under similar circumstances, provided the temperature be higher than a red heat.

In these remarks, I would be understood to speak only of common batteries, as, for instance, of forty or sixty pairs of three inch plates. In the case of larger batteries, there is a considerable difference.

Chemical analysis of the Native Chloride of Carbon, a singular mineral. By John W. Draper, *Christiansville, Mecklenburg county, Virginia.*

The changes that take place in the living body, are so much con-

trolled by the operation of the vital principle, that it is very difficult to account for the production of many substances, which, from their uniformity of composition, are evidently the results of a continued disturbing action, upon the usual play of chemical affinity. It is only after death, that the uncontrolled action of the particles of different matter takes place, in a more simple form, and yet when we are even able to set aside the forces exerted by the vital principle, so prone are the elements which enter into the composition of vegetables and animals, to enter into unexpected modes of union, that we often find them assuming complex forms, when they ought, by following the usual laws of chemistry, to put on such as are more simple.

These remarks are very applicable to the substance, whose analysis forms the subject of this paper. I found, during an excursion to Sheerness, Kent, (England) in the summer of 1832, a white efflorescence on the surface of a septaria, on the beach of the Island of Shepey. The coast of this island looking towards the north, is very precipitous, but owing to land springs, and the nature of the soil, frequent slides take place. Whole acres slip down at once into the sea, and their debris extending a long way beyond low water mark, makes the beach shelve very gradually to seaward. These slides usually uncover large masses of septaria, which are used in the dock-yard as a cement. It was on the surface of one of these, that this efflorescence was found. The greater part of it is, at present, in the possession of Dr. Turner, Professor of Chemistry in the University of London.

At the time of collecting this substance, the weather was very fine, and the sky unclouded; there had been no rain for some time. At first, I mistook it for nitrate of potash, but on closer examination found it could not be that substance. It was of a pure white colour, and, like spermaceti, slightly agglutinated when a little of it was pressed between the fingers. It had a faint, disagreeable odour, like decaying fish, was of a light, feathery appearance, like snow. On examining it with more attention, I concluded that the form of the crystal must be a four sided prism, and from that circumstance, that it could not be nitrate of potash.

Not having an opportunity to examine the small sample I had gathered, until some weeks after, I found, that during the time it had been laid aside, it had contracted much in bulk; this might have arisen either from chemical changes, or from its mechanical property of agglutination; the fishy scent was gone, but the substance was still faintly odorous. My first object was to determine whether it was nitrate of potash, whose crystalline form was affected by the presence of extraneous substances; for this purpose, I exposed it to a test, which I commonly use to detect a very minute crystal of that salt, viz. by laying it on a small bit of paper, and setting fire to the end of the paper—as soon as the flame reaches the crystal, a slight deflagration ensues. I was much surprised to find that the substance itself caught fire, and whilst burning, evolved large quantities of carbon.

Subsequent experiments showed, that this substance burnt entirely away, with evolution of much carbon, leaving no residue. Litmus paper, held in the flame, was strongly reddened. To ascertain the nature of the acid evolved, a portion of the substance was burnt under a glass, whose sides were moistened with water. Nitrate of silver discovered the presence of muriatic acid, in the liquid. I now perceived, that the substance was a chloride of carbon, and therefore entered into a more detailed examination of its nature and properties.

This substance is of a whitish aspect, and feels much like spermaceti; it smells faintly, and is lighter than water; it sinks in ether, its specific gravity being about 950. It is insoluble in water, but soluble in four times its weight of ether at sixty degrees, Fahr. Boiling ether takes up a larger quantity, but deposits it again on cooling. It is a non-conductor of electricity—fuses at 235° Fahr., and may be distilled without change—at lower temperatures it slowly volatizes, and may be sublimed from a water bath, in beautiful feathery crystals. It is soluble in alcohol, and hot volatile oils. It burns with a yellow flame, fringed at the upper part with red, and the lower with green.

Sulphuric acid has no effect in the cold, but with the aid of heat, the mixture becomes black, and much sulphurous gas is given out.

When sulphur or phosphorous is fused with this substance, chlorides of those bodies are formed, and carbon deposited, of a shining metallic aspect. Potassium takes fire when heated along with it, forming chloride of potassium, and carbon is deposited. In one instance, this action was so energetic, that the glass tube in which it was performed, burst, and was separated from the other apparatus, with a loud detonation.

I passed the vapour through a red hot tube, and found that muriatic acid gas was disengaged, and carbon deposited. From this I was at first inclined to infer the existence of hydrogen in the compound, and therefore attempted to gain more certain intelligence on that point. On fusing sulphur along with this substance, a moderate quantity of sulphuretted hydrogen was detected; and by the action of sodium, a still larger quantity of pure hydrogen was produced. But, on passing the vapour over peroxide of copper, chloride of that metal, and carbonic acid, were the sole products, from which I infer, that if hydrogen does exist in this substance, it is as an impurity.

Iron, tin, and zinc, at a red heat, decompose this substance; chlorides being formed, and carbon deposited. Peroxide of mercury is changed into calomel, carbonic acid given off, and carbon deposited. From these experiments, I suppose, that setting aside the existence of hydrogen in the compound, which is most likely extraneous, this substance is composed of:—

Carbon,	. .	2 atoms,
Chlorine,	. .	1 atom.

Of the non-existence of hydrogen, I would not, however, speak decisively, for the whole weight of the substance submitted to analysis, was much less than ten grains. The weight of what was collected at first, might be about 200 grains.

The production of this substance, to judge by its scent at first, and the locality in which it was found, seems to be referable to a marine animal. But through what singular changes must a dead fish pass, before its remains would leave a chloride of carbon, nearly pure.

On the present state of the Science of the Tides. By the Rev. W. Whewell, *Fellow and Tutor of Trinity College, Cambridge.*

(*Continued from page* 231.)

DIRECTIONS FOR TIDE OBSERVATIONS.

THE ESTABLISHMENT OF THE PLACE.

The interval at which high water follows the moon's meridian passage, or transit, at a given place, varies from day to day, (being affected by the semi-menstrual inequality.)

The *Vulgar Establishment* is the duration of this interval on the day of new or full moon.

The *Corrected Establishment* is the mean duration of this interval.

The "establishment" of any place is usually said to be the hour of high water on the day of new, or of full moon. The time of high water at London Bridge on September 28, (which was full moon,) was about two o'clock. It will be the same, or nearly the same, on every other day of new or full moon. Hence, two hours exactly, or nearly, is the establishment of London Bridge. In the same manner, at any other place, the time of high water falls very nearly at the same time on all the days when the moon is new, or full. At Portsmouth, this time is forty minutes past eleven; at Plymouth, thirty-three minutes past five; and thus, eleven hours and forty minutes is the establishment of Portsmouth, and five hours and thirty-three minutes the establishment of Plymouth.

This hour was called the *establishment* of the place, from an opinion that the differences of the tide hours at different places, depended solely upon the difference of the establishment; so that this hour being established, the whole course of the tides was settled also. This is not exactly true. If it were so, we could use tide tables of London to find the time of high water at Portsmouth, merely adding or subtracting the difference of the establishments of the two places; but in reality, this way of proceeding would lead us into error, as I have already stated.

It is not true, that the differences of tide times at different places, depend *solely* upon the differences of the establishments; they depend upon other differences also, as I shall endeavour to explain hereafter. The establishment may be considered as the starting point from which the tide hours set off every new or full moon; but these hours differ, not only in the point from which they start, but also in the pace at which they proceed; for this is, though in a smaller degree, different for different places.

The establishment is, however, much the most important of the circumstances which influence the tide hours at any place, and, therefore, deserves to be attended to in the first instance.

If we say that the establishment is "the time of high water on the day of new, or of full moon," the reader may naturally ask, *which* high water? since there are two on the same day. Are we to take that of the forenoon or that of the afternoon? On the full moon day of the 28th of September, the tide of London Bridge was at one hour and fifty-nine minutes in the morning, and at two hours and fifteen minutes in the evening. Which of these times is to be selected as the establishment?

The proper reply to this question would be, "*that* time is to be taken which corresponds to the exact moment of the full moon." But this introduces a new difficulty; for neither of the tides happens at the moment of the full moon. The full moon is at seventeen minutes past eleven in the afternoon; and it can rarely happen that the tide should occur at the very instant when the moon is new or full.

The reason why the tide hours of the forenoon and afternoon are different, is, that the tides are principally regulated by the moon, in consequence of which they fall later and later every half day, by about twenty-four minutes on an average, when we refer them to common time, that is, to the time of the *sun* passing the meridian. Hence, this perpetual difference of the hour will disappear, if we refer the tide to the time of the *moon* passing the meridian. Let us do this with respect to the tides above mentioned. The times of the moon's passing the meridian, were the afternoon of September the 27th, at eighteen minutes past eleven, and the morning of the 28th, at thirty-eight minutes past eleven. Thus the morning tide on the 28th (at fifty-nine minutes past one) was two hours and forty-one minutes after the moon's southing; and the afternoon tide of the 28th (at fifteen minutes past two) was two hours and thirty-seven minutes after the moon's northing. The difference is only four minutes. And, at whatever period of the day the tide had occurred, the interval between the moon's passage and the tide would have been the same, within a few minutes.

Hence, we describe the (vulgar) establishment to be "the interval at which high water follows the moon's meridian passage on the day of new, or full moon. And, taking this definition, it is not necessary to specify whether we mean the forenoon or the afternoon tide, because each of the two follows the next preceding southing or northing of the moon, at very nearly the same interval.

When I speak of the moon's northing, I mean her passing the meridian on the north side of the heavens, which will generally take place when she is below the horizon. And the time at which this occurs may easily be calculated when we know the time of the two successive southings between which this northing is intermediate.

This may serve as an explanation of the *vulgar establishment*, as described in the above "memoranda and directions."

The interval at which the tide follows the moon's passage across the meridian continues nearly the same, not only for the two tides of the same day, but also for all the tides of successive days. The tides are mainly governed by the moon; and, though the interval at which they follow the sun's transit, or noon, varies to all the hours

of the day in the course of a fortnight, the interval at which they follow the moon's transit is only altered at the same place by about two hours at the most.

Thus, in the course of fifteen successive days, the intervals of the tide and the moon's transit are as follows:—

	h. m.			h. m.	
Sept. 28,	2 41	morning tide	Oct. 6,	0 20	afternoon tide
29,	2 36		7,	0 50	
30,	2 21		8,	1 42	
Oct. 1,	2 4		9,	2 12	
2,	1 48		10,	2 21	
3,	1 7		11,	2 18	
4,	0 43	afternoon tide.	12,	2 9	
5,	0 29				

And this interval will go on alternately decreasing and increasing for seven or eight days each way.

Now, this interval on the day of new, or of full moon is, as has been stated, the vulgar establishment; and if all the intervals were equal, the establishment might be got from the observation of the tide on any one day. But, in consequence of the continual increase and decrease of the intervals which has been mentioned, a correction is required in this way of obtaining the establishment, namely, the correction for the half monthly, or semimenstrual inequality, which will hereafter be explained.

Since the interval of tide time and moon's transit goes through all its changes in half a month, as has been mentioned, if we take the *mean* of such intervals for half a month, we shall have an interval which is independent of these half monthly changes. This mean interval will differ, by a small quantity, from the vulgar establishment; but, as it is independent of the half monthly inequality, which the vulgar establishment is not, I have called it the *corrected establishment.*

Thus, the mean of all the above intervals is one hour aud forty-seven minutes, which is the corrected establishment, while the vulgar establishment, as collected from these observations, is two hours and forty-one minutes. The corrected establishment is always less than the vulgar establishment, for reasons which will appear hereafter.

THE SEMIMENSTRUAL INEQUALITY.

It has already been said, that the time of high water is regulated mainly by the time of the moon's transit or southing. The establishment is the interval of time by which the tide follows the moment of the moon's southing, on the day of new or of full moon; and the interval at which the tide follows the moon's southing every other day, is *not very much* different from this. It may, however, be different to the amount of above an hour, and we have now to speak of this difference.

If at any port, for instance at London, we take the interval

which elapses between the moon's southing and the time of high water, on every day from new to full moon, we shall have the following succession:—

Moon's Age.	Tide after Moon's Transit.	Time of Moon's Transit.	Tide after Moon's Transit.
Days.	h. m.	Hours.	h. m.
1	1 57	0	1 57
2	1 45	1	1 42
3	1 32	2	1 26
4	1 19	3	1 11
5	1 6	4	0 56
6	0 54	5	0 45
7	0 46	6	0 42
8	0 43	7	0 52
9	0 45	8	1 23
10	1 1	9	1 56
11	1 27	10	2 10
12	1 57	11	2 8
13	2 8		
14	2 10		
15	2 4		

We see, in the second column, that these intervals are unequal; but after half a month, (from new to full moon, or the reverse,) we come back to the original interval; and if we were to go on further to the sixteenth, seventeenth, and succeeding days of the moon's age, for instance, that is to the full moon, and second, third, and succeeding days from the full moon, we should have a recurrence of nearly the same intervals which we had on the day of new moon, and on the first, second, and succeeding days from the new moon.

In the above table, along with the intervals corresponding to the moon's age in days, I have placed the intervals corresponding to the hours of the moon's transit, or southing. In fact, by stating the hour of the moon's transit, we determine her age, and determine it much more accurately than by saying she is so many *days old*. For, if we say the moon is three days old, (or that it is the third day of the moon's age,) this *may* mean any period of a lunation which is more than two, and less than four days from the new moon; and it will be nearer to the one or the other of these limits, according as the new moon took place at a late or at an early period of that twenty-four hours which we call the first day of the moon. Therefore, when we only know that the moon's age is three days, we only know that the interval of the moon's transit and high water at London ought to be less than one hour and forty-five minutes, and greater than one hour and nineteen minutes. But if the moon pass the meridian at two o'clock, solar time, we know that she must be exactly thirty degrees of hour angle from the sun, and, therefore, that the interval of tran-

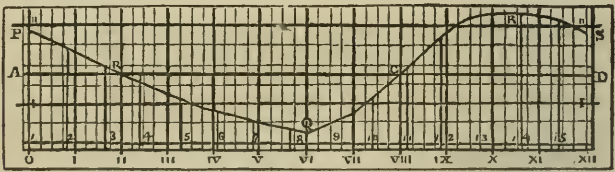
sit and tide should be exactly one hour and twenty-six minutes.* And the same reasoning applies every day, because the moon is, on every day of the month, at a different angular distance from the sun, and passes the meridian at a different hour of the twenty-four. And, therefore, though it is a very inaccurate way of describing the moon's age to say she is so many days old; it is a very accurate way, to say she makes her transit at such an hour.

This way of marking the stage of the lunation, or semi-lunation, of which we have to speak, I shall adopt in future; and I recommend it to naval men, and to all persons who have to take into account the age of the moon, in cases where any sort of accuracy is required.

This being understood, I proceed to make some remarks on the inequality of the intervals of time between high water and the moon's transit; and for the reasons just stated, I shall take the second part of the above table, in which these intervals are referred to the corresponding hours of transit.

1. The inequality of the intervals goes through all its changes, or completes its *cycle*, in a half revolution of the moon, (in the passage from new to full moon, for instance;) it is hence called the *semimenstrual*, or half monthly *inequality*.

2. The change of the interval will be more easily comprehended, if the changing magnitude is expressed by spaces which can be looked at by the eye at one time.



Let a base line be taken, as 0 I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII. in the figure, and this being divided into twelve equal parts, let lines be drawn perpendicular to it, through all the points of division. Such lines are called *ordinates*. Let there be measured on these ordinates, from the base line, distances representing the twelve intervals in the last column of the above table; and let a curve line, as PBQCRS, be drawn through the extremities of all these measured lines: this curve line is the *curve of the semimenstrual inequality*.

3. This curve has, for all ports for which sufficient tide observations have hitherto been obtained, the same general figure. It has a *minimum* and *maximum*, or least and greatest ordinate, as at Q and R; or, as it may be otherwise expressed, it resembles the letter S laid along the line. If we proceed from the new (or full) moon, its height first diminishes, then increases, and then diminishes again.

4. If a line be drawn parallel to the base line, at a distance equal

* In the whole of this section I leave out of consideration all inequalities except the semimenstrual; as those arising from declination, &c.

to the *mean* ordinate, the curve of the semimenstrual inequality will be *symmetrical* with respect to this line; and this line is called an *axis* to the curve.

Thus, the line ABCD, which is drawn at a distance from the base line representing one hour and twenty-six minutes, is an axis to the curve. It cuts the curve in the points B and C, and the parts before and after the point B are exactly similar above and below the line; and also the parts before and after the point C.

This mean ordinate represents, for any place, what I have called the *corrected establishment;* which is what Laplace has called the *fundamental hour* of the port. The *vulgar establishment* is represented by the ordinate at the beginning of the curve, on the first day of the moon's age, or when the time of the moon's transit is 0.

5. Though the curve is symmetrical on the two sides of the line AD, it is not symmetrical with regard to the two ends of that line. The distance BC is exactly half of AD, but the curve makes a smaller angle with the axis at B than it does at C.

This circumstance in the form of the curve corresponds to this fact; namely, that the intervals (of moon's transit and high water) increase more rapidly after their minimum than they decrease before it. They diminish from two hours and ten minutes to forty-three minutes in nine days, and increase again from forty-three minutes to two hours and ten minutes in six days.

This fact is hitherto found to be true, by experience, at all the places for which we have sufficient observations: it also agrees with the consequences of the theory. It will be seen in the form of the curves for London, Sheerness, Portsmouth, Plymouth, and Brest, if figures like the annexed be drawn for those places.

6. Since we know the effect of the semimenstrual inequality, we can correct for it; and thus, from a tide observed at any period of a lunation, deduce the establishment.

Thus, if at Sheerness, when the moon's transit was at two hours, the high water was at two hours and nine minutes, if we suppose the semimenstrual inequality to be the same as it is at London, we should reason thus:—The semimenstrual inequality makes the interval less by thirty-one minutes, when the moon's transit is at two hours, than when the transit is at 0 hours; (see the above table.) But in this case, the transit being at two hours, the interval is 0 hours and nine minutes. Therefore, when the transit is at 0 hours, the interval will be forty minutes; and 0 hours and forty minutes is the vulgar establishment of Sheerness.

This assumption, that the semimenstrual inequality is the same at all places for the same age of the moon, is not exact, in consequence of the difference of what I have called the *age of the tide.*

7. The intervals between the tide hours on successive days are unequal, in consequence of the semimenstrual inequality. These intervals are least when the tide is greatest, (at spring tides,) and greatest when the tide is least, (at neap tides.)

This will appear from the above table; for since the semi-lunation

is fifteen days nearly, (fourteen three-quarters more nearly,) the moon's time of transit, which increases by twelve hours in these fifteen days, will increase by forty-eight minutes, nearly, each day. We shall therefore have the following times of high water on each day, by finding the time of the moon's transit by the successive addition of forty-eight minutes each day, and the time of high water by adding to this the interval at which the tide follows the moon's transit.

I neglect here the difference between thirty days and an exact lunation; and I neglect likewise the inequalities of the moon's motion; for these enter into another part of the subject. I suppose also the new moon to occur at noon on the first day.

Moon's Age.	Time of Moon's Transit.	Tide after Moon's Transit.	Time of High Water.	Difference.
Day.	h. m.	h. m.	h. m.	h. m.
1	0 0	1 57	1 57	0 36
2	0 48	1 45	2 33	0 35
3	1 36	1 32	3 8	0 35
4	2 24	1 19	3 43	0 35
5	3 12	1 6	4 18	0 36
6	4 0	0 54	4 54	0 40
7	4 48	0 46	5 34	0 45
8	5 36	0 43	6 19	0 50
9	6 24	0 45	7 9	1 4
10	7 12	1 1	8 13	1 14
11	8 0	1 27	9 27	1 18
12	8 48	1 57	10 45	0 59
13	9 36	2 8	11 44	0 0
14	10 24	2 10	12 34	0 42
15	11 12	2 4	13 16	0 41
16	12 0	1 57	13 57	

It appears from the last column of this table, that the time of high water on successive days is, at springs, later by only thirty-five minutes each day; while at neap tides it is later by seventy-eight minutes, or more than double the former interval.

Nearly the same rule would be proved to hold at any other place.

This agrees also with the theory: according to which, the daily retardation of the tides at springs and at neaps, respectively, should be in the proportion of the sum of the lunar and solar tides to the difference of the same tides; where, by the lunar tide, I mean the tide which the moon would produce if the sun were not there; and, by the solar tide, the tide which the sun alone would produce. Hence, the lunar and solar tides are in the proportion of fifty-six and a half, to twenty-one and a half, or of five to two nearly.

The same rule would hold for the retardation of the tides from one *half* day to another, except in so far as it might be modified by the effect of the *diurnal difference of the tides.*

THE AGE OF THE TIDE.

The *circumstances* of each tide do not correspond to the places of the Sun and Moon at the time of that tide, but at a time one, two, or three days earlier; this distance of time is called the *Age of the Tide.*

Two such circumstances may be especially noted:

1°. The spring tide, or *highest* high water, is not on the half day of New or of Full Moon, but at a certain tide on some later half day.

2°. The interval of tide and moon's transit has not its *mean* value on the half day of New or of Full Moon, but for a certain tide at some later half day.

The distance of time from the New or the Full Moon to the time when the interval of tide and moon's transit has its mean value, is the *Age of the Tide.*

The age of the tide may be thus explained:

1. The mean ordinate of the curve of the semimenstrual inequality, or the mean interval of the moon's transit and the tide, takes place, at London, at the time when the moon's transit is about two hours, or her age about two days and a half from new or full.

This is also the time when the tides are highest; and since, by the theory, both the mean interval and the highest tides ought to correspond to new and full moon, we may suppose that this mean ordinate *corresponds* to the new and full moon, but that it does not *occur* till two days and a half after that time, in consequence of the length of time which is required to transmit the moon's effect upon the ocean to the port of London.

The length of time required for this purpose I have called the *Age of the Tide.* Mr. Lubbock, following Laplace, calls it the *Retard.*

2. The time which is required to transmit the moon's effect to different places is different. Thus, if we calculate it as we have done for London in the last article, it is a day and a half at Brest, and two days at Sheerness.

It appears also, that the tide hour is later and later at these places in the same order: thus, on the same half day the tide is at 0 hours and twenty-eight minutes at Brest, at nine hours at Sheerness, and at ten hours and nine minutes at London.

We may therefore suppose the tide to *travel* from Brest to London, and that the time of transmitting the moon's effect to each place depends on the time of the tide thus travelling to that place.

On this supposition, the tide would be earlier, and the time in which the effect of full moon reaches it would be smaller, as we go further back in the direction in which the tide hours are earlier. Thus, the tide at the Cape of Good Hope appears to be about twelve hours earlier than at Brest; we should expect, therefore, that the greatest tides, and the mean interval of tide and transit, would, at that place occur only one day after new and full moon, instead of a day and a half, as at Brest, or two days, as at London.

3. But our information with regard to this transit in the phenomena of the tides, is not sufficiently extensive and exact to enable us to reason upon it with confidence and accuracy. A good series of tide observations, continued for a few years, at any place in the southern hemisphere, would, on this account, be of singular value and interest.

4. The effect of the age of the tide upon the curve of the semimenstrual inequality, is not at all to alter the form of the curve itself, but to make the points B C, of intersection with the axis slide further and further from the new and full moon, as the age of the tide is greater. This change is apparent, if we draw the curves for Brest, Sheerness, and London, (as Mr. Lubbock has done in the Philosophical Transactions for 1833,) and then draw their axis.

5. A consequence of the different age of the tide for different places, is, that the tide tables which are good for one place cannot be applied to another, merely by addition or subtraction of certain hours and minutes, at least if much accuracy be wanted. The London and the Liverpool tide tables do not differ on the same day by a constant quantity; and neither of them apply exactly to other places on the coast.

On the Specific Heats of Solids.

On the methods of determining and calculating the specific heats of certain solids, with some precautions to be observed in the experiments. By Walter R. Johnson, *Professor of Mechanics and Natural Philosophy in the Franklin Institute of the State of Pennsylvania.*

The practice which formerly prevailed, of presenting to the public, statements respecting the *results* of philosophical experiments, without an exact detail of the methods adopted for their attainment, and the precautions employed to avoid error, has, in many instances, involved the necessity of *repetitions*, long and laborious, of what ought once for all, to have been definitively settled. The *verification* of a philosophical truth, by a method unlike any previously employed, is a matter entirely different from the processes just referred to; and however well we may be satisfied of a truth, established in one manner, there will always be found both pleasure and profit in attaining the same general conclusions, by methods and considerations independent of each other. There is not, perhaps, a better illustration of this remark, than the variety of methods which may be employed for determining the specific heat of solids. The earliest was that of *mixture*, and consists in immersing the solid, at a known temperature, in water, (or some other liquid,) at a temperature either above or below its own. The temperature lost by the hotter body, and that gained by the cooler, will, with proper corrections, give, when compared, the specific heat of the body under trial.

The next method, that of Lavoisier, employs, instead of the rise

or fall of temperature in water, the latent heat of *water passing from a state of ice;* and the weight of this solid, which any other given solid will melt, while cooling from any known temperature, down to the melting point, is the measure of its specific heat, which, being referred to the quantity of ice which a mass of water, equal to that of the solid, would have melted in cooling the same number of *degrees*, gives us the numerical expression of the specific heat of the solid.

The *third method* employs the cooling power of air, and the *times* which will be required to depress the temperatures of the different solids through a fixed range of the thermometric scale, are taken as the indices of the specific heat. This is the method employed by Professor Meyer on the woods, and by Professor Leslie and Mr. Dalton, on other bodies.

The *fourth method* employs the heat which becomes latent when water is rapidly converted into vapour at its *boiling point*, by the direct and sole agency of the solid, heated to a known temperature above that point. This method may be successfully employed to determine the latent heat of melting metals, as well as their specific heat, from 212° to their melting points, and also their change of capacity, if any, after they have passed into the liquid state. The weight of boiling water which they will, under different circumstances, convert into vapour, compared with the effect of the same amount of water, conceived to be heated to the same temperature as the solid, gives again the numerical expression of the specific heat.

It is evident, that if this fourth method be adequate to give the specific heat when the temperature is known, it is also competent to give the temperature when the specific heat is known; but in order to remove all doubt as to its applicability to the latter purpose, it is well to ascertain by different and independent methods, the exact index of the specific heat, whether uniform or variable, of the solids which may be employed for this purpose. Among the substances adapted to this end, are pure malleable iron, and pure platina. They are both highly indestructible, when heated without the access of foreign ingredients, such as oxygen, sulphur, carbon, silica, &c. and though the specific heat of the former is represented by some writers as increasing pretty rapidly with the temperature, yet this increase is not by any means in so great a ratio, as that of its dilatations, which other authors have proposed to employ as standards for measuring very high temperatures. As to platina, its specific heat is low, and its increments of rate, both in dilatation and specific heat, are represented as very moderate. I may here remark that the experiments of Dulong and Petit on this subject, appear to have been erroneously stated in one part of their prize memoir, which has doubtless led to the supposition that they discovered no increment of capacity in platina by the elevation of temperature. In their table of the specific heats of the different metals at 100° and 300° centigrade, as originally published in the Annales de Chymie, vol. vii. we find .0355 placed, under both of those temperatures, against *platina.* The same numbers are transferred into every English edition

of works in which I have seen that table, with the single exception of Turner's Chemistry, in which the number is, both for 100° and 300°, .0335. Yet, in a subsequent table of the Memoir, Petit and Dulong have given the indications of thermometers formed of the different metals, on the basis of their specific heats, compared with those of an air thermometer at 300°, and they have put down that of platina at 317.9, which it obviously could not be, if its specific heat were invariable; but supposing that heat to increase from .0335 at 100° cent. to .0355; at 300° the indication ascribed to it would be correct. In a recent edition of Turner's Chemistry, by Dr. F. Bache, of this city, this error has been corrected.

But, to return to the subject of iron, we find in the various works of philosophers, a remarkable discrepancy between their statements of the specific heat of this metal.

The following are among the results obtained by the different individuals whose names are annexed:—

On iron, of specific gravity, 7.876, the specific heat was found	.1260	by Wilcke
On soft bar iron, sp. grav. 7.724,	.1190	Gadolin
On sheet iron, . .	.1090	Lavoisier
On iron, of what quality not specified,	.1250	Kirwan
do. do.	.1269	Crawford
do. do.	.1450	Irvine
do. do.	.1300	Dalton
On cast iron, abounding in plumbago,	.1240	Gadolin
On white cast iron,	.1320	do.
Iron, (kind not specified) between 32° and 212°,F.	.1098	Petit and Dulong
do. do. between 32° and 392°,	.1150	do.
do. do. 32° and 572°,	.1218	do.
do. do. 32° and 662°,	.1255	do.

The mean of these thirteen numbers, is 1.1236. The wide discrepancies are probably owing to the circumstances under which they respectively operated, and to differences in the metal.

Nor is the disagreement confined to the general result; for while Crawford and Irvine contend that the specific heats of bodies remain constant at all temperatures, Dalton, Dulong, and Petit, maintain that they increase with the increase of temperature. But it seems difficult to reconcile this supposition with another result of theirs, viz: that the specific heat of all bodies is inversely as their atomic weights, unless we could suppose, what is manifestly absurd, that the atomic weight varies with the temperature, or that in different bodies the *rate of increase in specific heat* varies always inversely as the atomic weight. Thus if H were supposed the specific heat of any body, and A its atomic weight, and if dH were the increment of specific heat for a given rise of temperature, then not only must $AH =$ the constant C, but also $A\ (H + dH)$ must $= C'$, and of course $AdH = C''$, in order that another body, having the atomic weight a and a specific heat h, should give $ah = C$, $a\ (h + dh) = C'$, and $adh = C''$. Let us observe how far their table of the

increase of specific heat between 212° and 572° Fahr. will bear out this supposition. The atomic weights are those given by Petit and Dulong themselves, with the exception of those of mercury and antimony, which are derived from Dr. Thompson.

Metals.	Atomic weights.	Petit and Dulong's difference of specific heat between 212° and 572° Fah.	Values of C″ from these data.
Mercury	12.5	.0020	.025000
Antimony	5.5	.0064	.023100
Platinum	11.26	.0020	.022520
Silver	6.75	.0054	.036450
Copper	3.957	.0064	.025280
Iron	3.392	.0120	.040704
Zinc	4.03	.0088	.035464

To attribute the character of "*constant*" to such numbers as are found in the fourth column of this table, would be little satisfactory to any who were not prone to uphold a theory at all hazards. Even the apparent correspondencies between mercury and copper—antimony and platina—silver and zinc—are probably mere accidental coincidences. Iron, on which the authors to whom I have referred, appear to have bestowed most attention, gives a result far removed from all the rest, and nearly double to some of them.

The foregoing considerations, together with the use to be made of the specific heat of iron and platina in generating vapour for pyrometrical measurements, have induced me to attempt a re-examination of certain parts of this subject, and for this purpose, I have taken the method originally adopted by Wilcke and Black, viz: that of immersing the hot metal in cold water, in connexion with the fourth method above described, that of using the latent heat of vapour to ascertain the specific heat when the temperature of the solid is known.

In experiments of this nature, several precautions are to be observed, and a considerable number of sources of error anticipated, against which, if we cannot directly guard, we must provide for them the necessary corrections.

1. *We must attend to the character and condition of the metal*, its freedom from alloys or impurities, its specific gravity, its freedom from foreign matter on the surface, particularly from *vaporizable* matters, which may, by being converted into vapour in passing from the source of heat to the cold water, essentially diminish the temperature; or, if in any considerable quantity, may aid in elevating that of the water, and thus give a result too high. I have been sometimes embarrassed by this source of error. In a series of eight experiments, made by heating in a bath of oil, on a given mass of wrought iron, at a mean temperature of 236° Fahr., the temperature of the room being 76°, and that of the water at commencement, 74°.86 in a glass vessel of known specific heat, containing at every trial the same weight of water, and measuring the temperatures every time by the same ther-

mometers, I obtained as the mean result, .12332,—the lowest being .12131, when the iron was immersed at 192°; and the highest, .12920, when the metal was only 190°.

To ascertain how far this source of error would be obviated by adopting a bath of mercury. I made eight experiments in the same glass vessel, on the same piece of iron, and with all other circumstances corresponding to the former set, except that the temperature of the metal at immersion, was at a mean $323\frac{3}{4}$ degrees, and of course, the specific heat, according to Dulong and Petit, ought to have come out higher than in the other series; instead of which, it was at a mean of .12217, the lowest being .12119 at 338°, and the highest .12499 at 350°. Here the higher temperature gave the higher result.

2. The second precaution relates to the *condition of the water used in the experiment.* The specific heat of saline solutions and earthy mixtures being different from that of water, care should be taken that only pure water be employed. That which has been recently distilled should be preferred, as it is less likely to be charged with air than that which has been long exposed in open vessels. If any considerable quantity of air contained in the liquid, be suddenly expanded, it may rise to the top and escape, carrying with it the portion of heat which has given it so much enlargement of bulk. This would cause an error *in deficiency.*

3. *The temperature and hygrometric state of the air, in which the experiment is conducted*, require attention. It is obvious, that if we commence the experiment at a temperature below the dew-point of the air, the vessel will be accumulating moisture *before*, and *during*, the experiment, and if it remain but for a short time at the initial temperature before the hot body is immersed, the consequence will be, that the latent heat of the vapour being employed in elevating the temperature of the water, the latter receiving from 1000 to 1200 degrees of heat for every unit of water condensed, will cause an error *in excess.* If, however, the vessel has remained in its cold state for some time, and then received a considerable elevation of temperature from the hot body, the whole exterior of the vessel will act as the wet bulb of a thermometer, and tend to keep the temperature of itself and its contents down to the *evaporating point.* This would cause a serious error *in deficiency.*

Both these errors are obviously to be avoided, by not allowing the temperature of the vessel to sink below the dew-point.

In regard to the relative temperatures of the vessel, and the surrounding air, we must observe, that as the latter part of the process, when the solid and the water are approaching an equilibrium, goes on very slowly, it will be necessary to commence our experiment with the water, nearly as much below the actual temperature of the apartment as the increase of temperature is expected to be, in order to terminate as little as may be above the surrounding air. These two conditions, of beginning above the dew-point, and never ending much above the temperature of the air, can only be complied with

when the air is tolerably dry. Such should, therefore, be the state of weather selected for experiments of this nature.

4. *The construction, magnitude, and specific heat of the thermometer,* used to measure the temperature of the water, is an object of some consequence in the determination of this delicate question. To carry entire accuracy into the subject, it will be necessary to know the separate weights of the materials which compose it, and their several specific heats, and further to allow for an amount of water precisely equivalent to that part of the thermometer which is immersed during the experiment. In obtaining a thermometer for this purpose, I caused the tube to be carefully measured and weighed before the bulb was blown, to ascertain its weight per inch in length; then, knowing the length used to form the bulb, it was easy to ascertain the number of grains of glass *immersed* in any given experiment. By again weighing after the thermometer was filled, the weight of mercury it contained was exactly known, and by weighing the *scale* separately, and knowing its specific heat, the *equivalent in water* was found, answering to any portion of the whole instrument, which may be entered along the scale near the thermometric degrees. The necessity of allowing for a *scale* may, however, be obviated by using a naked-bulb thermometer, provided the *range* be sufficient, without including the naked part of the stem. But to attain this end, and at the same time possess the requisite subdivision of degrees, the bulb must be large, or the stem very long. Could we employ a cylindrical metallic containing vessel, fitted up with an apparatus to measure its own longitudinal expansions with perfect accuracy, it would perhaps be the best kind of thermometer for such experiments. The specific heat of mercury, at least within the range where a thermometer for our present purpose would be used, is, according to the four independent determinations of Lavoisier, Kirwan, Crawford, and Dulong, .0327. The specific heat of glass, given by six different philosophers, is at a mean, .18511, that of Irvine being .2000, and that of Kirwan, .1740, as the extremes. By three trials on flint glass, in a manner hereafter to be referred to, I obtained a mean of .17854, which is *less* than the above mean result by .00657, and *more* than that of Dulong and Petit by .00154.

If the scale be of brass, we have its specific heat by the mean result of Wilcke, Crawford, and Dalton's determinations, .11276, but as the conducting power of this metal is high, as well as its rate of expansion, it ought, if possible, to be avoided as a part of the immersed thermometer.

5. *The thermometer which measures the heat of the solid before immersion,* should be faithfully compared with that which is used in the water. Thermometers of extensive range are often found inaccurate from containing minute portions of air. It would, for this reason, be desirable to compare their indications with the fusing points of tin and lead, as well as the boiling point of water and mercury. To be sure of at least two points in the temperature of the hot body, it will be well to place it in an iron vessel containing mercury, immersed in boiling water, for *that* point, and in a bath

of melted tin, immersed in boiling mercury, to get the utmost range of temperature measurable by that liquid. By forming a suitable covering for the bath of mercury, and providing for the exit and condensation of its fumes, we may operate with perfect convenience in the method just described.

6. I have already mentioned the necessity of confining the range of temperature taken by the water during these experiments. If we terminate the experiment but one or two degrees above the actual temperature of the room, the loss by radiation and conduction on one side, will in general be so nearly counteracted by the gain on the other, as to influence very little the actual result. But if we employ too small a vessel, the high temperatures of our solid may give too great an elevation, and then we shall have not only the radiation and conduction of the vessel, but the tension of vapour at the surface of the water; and the latter will be greater or less according to its greater or less distance from the dew-point. The absolute loss may be found by a separate experiment, exposing the vessel and water for some hours to the same temperature as that at which the trial took place, and in an atmosphere having the same hygrometric tension. The weight lost during the longer exposure, compared with its length of time, ought to be proportionate to the loss and time in the other case. The number of grains of vapour, would then be multiplied by its latent heat at the generating temperature, to obtain the absolute effect in cooling the mass from which it rose. This error, like that occasioned by the escape of air, and that by the evaporation of dew from the surface of the vessel, will be *in deficiency*.

7. The nature of the vessel containing the water, its surface, specific heat, and the space it leaves open to the air. It should be of such dimensions as to be completely filled when the thermometer and the body under trial, are immersed in the water. If of metal, its perfect homogeneity is to be ascertained, and if of glass, the specific heat should be separately ascertained.

8. To guard the hot body from loss of heat in passing from the source of heat to the cold water, I make use of a thick sheet iron cylindrical shield, which is kept constantly immersed in the melted metal, with the piece under trial, and conveys it to the very mouth of the water vessel, into which it is lowered by a fine wire or thread, enabling the operator to move it from one part of the vessel to another.

9. The vessel and its contents must be weighed with the greatest attainable accuracy at every trial. No reliance should be placed on the apparent levels of the fluid. Graduated measures are entirely out of the question in trials of this kind. To adjust the weight with readiness, I employ a dropping tube with a fine point, and instead of a piston, use a species of micrometer screw, to force out the liquid, or draw it in at pleasure. Drops weighing one-third of a grain, may be easily obtained by this instrument. The method of *substitution* is adopted in weighing, to avoid all inaccuracy in the beam of the balance.

10. A result is not to be taken as established, until it can be re-

produced at least within the limits of the errors of observation. I feel assured that much of the erroneous matter which has been published on this subject, has arisen from a want of due care and patience in repetion. Before closing these observations, it may be proper to add, that when, in any given experiment, the thermometer which measures the temperature of the water, is withdrawn, to insert the hot body, and afterwards returned to the liquid, it will, under certain circumstances of the air, be found to have changed its indication, the moisture remaining upon its surface, causing it to take the "*evaporating point*" as its stationary position. In this case, it must be noted on again immersing the bulb, and the change it has undergone recorded, and subsequently multiplied by the *equivalent* of the immersed part of the thermometer, to obtain the requisite correction.

The table exhibiting the data, calculations and results of experiments to determine specific heats in the manner above described, will contain the following particulars: 1st, The number of the experiment. 2d, The kind of heating liquid employed. 3d, The dew-point of the apartment. 4th, Its evaporating point. 5th, The weight of solid under trial. 6th, The temperature at which it is immersed. 7th, Temperature of the water. 8th, Temperature of the thermometer when immersed. 9th, Temperature of the air. 10th, Resulting temperature of the water. 11th, Gain of temperature by the water, containing-vessel, and thermometer. 12th, Loss of temperature in the solid. 13th, Time occupied by the experiment. 14th, Weight of water in grains. 15th, Equivalent of the containing-vessel in grains of water. 16th, Equivalent of the part of thermometer immersed. 17th, Sum of the equivalents in water, containing vessel, and thermometer. 18th, Product of the preceding column by the gain of temperature. 19th, Product of the weight of solid by its loss of temperature. 20th, Correction obtained by multiplying the equivalent of the thermometer by its variation from the initial temperature of the water. (This correction will be either positive or negative according as the evaporating point is below or above the the *initial temperature.*) 21st, Specific heat obtained by dividing the 17th column *corrected*, by the 18th. Other corrections may be inserted when necessary, according to the observations already made.

To present the several cases to which we have referred in the preceding remarks, the following formulas may be adopted:

1. When the specific heat of the containing vessel is to be ascertained, by first filling it with water of a known temperature, and letting it stand until we are sure that a stationary point has been attained, then emptying it, and instantly refilling with water of a different temperature; if the expansions of the vessel could be made to measure its own increase or diminution of temperature, we should have the simplest of all possible cases;—for calling

$w =$ the weight of water in grains,

$T =$ the degrees of change in temperature which it undergoes,

$g =$ the weight in grains of the containing vessel,

$t =$ the change of its temperature by the experiment,

and x = the specific heat of the material of which the vessel is composed, that of water being unity, we shall have

$Tw = gtx$ or $x = \frac{Tw}{gt}$ (1.) This supposes the experiment to be made with such regard to the thermometric and hygrometric state of the air, as to require no correction on that account.

2. If we introduce a mercurial thermometer, with a brass scale, to measure the change of temperature, putting

b = the weight of brass immersed,

m = the weight of mercury,

c = the weight of the glass bulb and that part of the stem which sinks into the water, we have, for the equivalent of the thermometer in grains of water, the following expression: $.11276\,b + .327\,m + .18511\,c$, and since by suspending the thermometer, or otherwise fixing it in a certain position for many experiments, we can always use the same part of its length, we may substitute for this complex term the simple expression e for the thermometrical equivalent in grains of water; then the formula (1) will become $x = \frac{T(w + e)}{gt}$ (2.) It was by this method of trial and calculation that the three experiments before mentioned gave .17854 for the specific heat of glass, though in the expression for the thermometer, I have chosen to use the mean of six other determinations, until I can repeat and vary the experiment, so as to be satisfied which is nearest to the truth.

3. The specific heat of the containing vessel being known, we proceed to that of any other solid, (wrought iron for example,) putting its weight in grains = i, and its specific heat = z. T will now represent the change of temperature, not only of the water and thermometer, but also of the containing-vessel, and t the change of the solid i; g, x, and e being the same as above; then will $itz = T(w + gx + e$ and $z = \frac{T(w + gx + e)}{it}$ (3.) Or the formula, may be simplified by representing the term $w + gx + e$ by W', whence $= \frac{T\,W'}{it}$ (4.) To this, as before stated, we must apply a correction, if the thermometer be not at the same temperature when immersed, as the water was when the solid was plunged into it. Calling the difference d, we have the correction $\pm de$, as before stated, according as the thermometer was *below* or *above* the water, and hence the formula becomes $z = \frac{TW' \pm de}{it}$ (5.)

4. If the specific heat of the solid under trial, and of the containing vessel g be the same, (as when a vessel of untinned sheet iron is employed to hold the water,) we may, if the specific heat be supposed not to vary within the limits of our experiment, employ the following expressions in which z is the specific heat of both, the solid and the water vessel, T, w, and e remaining as before. We then obtain the equation,

$itz = T(w + e + gz) = T(w + e) + Tgz$, and by transposition,

$$itz - Tgz = T(w + e,) \text{ whence } z = \frac{T(w + e)}{it - gT} (6.)$$

5. But if, instead of making the container of the same material as the body under trial, we choose to form it of any other kind, even of one whose specific heat is not yet known, we may, by using vessels of *different* thicknesses and the *same* liquid content, ascertain, by successive experiments, under otherwise similar circumstances, the specific heat of the material which composes the vessel. Thus two jars, capable of containing the same weight of water, may be formed of glass from the same melting pot, but one possessing two or three times the thickness of the other. We may then heat the same mass of iron twice, (or any number of times) to the same degree, and immerse it in water at the different trials in each of the two vessels at the same temperature, then putting

w = the weight of water contained in each glass,
g = the weight of the thicker glass,
g' = that of the thinner,
x = the unknown specific heat of glass,
T = the change of temperature of water and glass when g is used,
t = the change of temperature of iron when g is used,
T' = the change of temperature of water when g' is used,
t' = do. do. of iron when g' is used,
i as before = the weight of iron,
z = its specific heat,
e = the equivalent of the thermometer.

Then as the temperature of the water, the air, and the iron, are supposed to be the same in both cases, we shall have by (5) the two expressions,

$$1.\ z = \frac{TW' \pm de}{it} = \frac{T(w + e + gx) \pm de}{it}$$

$$\text{and } 2.\ z = \frac{T'W' \pm de}{it'} = \frac{T'(w + e + g'x) \pm de}{it'}$$

from which we derive,

$$3.\ \frac{T(w + e) + Tgx \pm de}{t} = \frac{T'(w + e) + T'g'x \pm de}{t'}$$

Hence

$$4.\ Tt'(w + e) + Tt'gx + t'de = T't(w + e) + T'tg'x \pm t\,de.$$

And by transposition, (supposing de the same in both cases,)

$$5.\ Tt'gx - T'tg'x = (T't - Tt') \cdot (w + e) \pm (t \mp t')\,de$$

And by division,

$$6.\ x = \frac{(T't - Tt') \cdot (w + e) \pm (t \mp t')\,de}{Tt'g - T'tg'}$$; which, if there be no correction for thermometric variation, will be reduced to the simpler form,

7. $x = \frac{(T't - Tt') \cdot (w + e)}{Tt'g - T'tg'}$ (7.) And as the value of x is now found, we may substitute it in either the first or second equation, to find the value of z. The first would give, (omitting the correction, $\pm\, de$,)

$$8.\ z = \frac{T(w + e) + Tg\left(\frac{(T't - Tt') \cdot (w + e)}{Tt'g - T'tg'}\right)}{ti.}$$

$$\text{or, } 9.\ z = \frac{TT'(g - g') \cdot (w + e)}{i\,(Tt'g - T'tg')}.$$

The necessity of applying the correction $\pm\, de$, arises from the liability of the warm current of liquid ascending from the hot metal to elevate the temperature of the thermometer above that which ought to be exhibited by the liquid when the maximum effect of the solid has been attained. By taking the thermometer out of the water at the instant the metal is immersed, and keeping it out till near the conclusion of the experiment, we not only have a better opportunity to agitate the liquid, but also avoid the deception just referred to.

If the experiment be commenced precisely at the *evaporating point*, the bulb of the thermometer, covered with a film of water, will be retained at that point, and no correction required.

6. The formula for the fourth method of determining specific heats which may serve as a *verification* of the one just presented, is founded on the fact that the *weight of vapour* generated by a given weight of metal, is proportionate to the *weight*, *temperature*, and *specific heat* of the metal employed.

The experiments in this case all terminate at the boiling point, but may commence at any known *superior* temperature. The result obtained will, therefore, be the mean specific heat between the temperature of boiling water, and that at which the metal enters the liquid.

Calling i = the weight of metal employed;

t = its temperature above boiling point at immersion;

and z = its mean specific heat from boiling point to the temperature at which it is immersed;

also v = the weight of vapour produced by the action of i;

and l = the latent heat of vapour from water boiling in the open air at the time and place of the experiment:

Then, by the above statement, we have (supposing no heat lost by any other means than vapourization,) the *effect* $= vl$; and the *cause* $= itz$. The latter is on the supposition that the experiment ceases, and the loss of weight in water is ascertained the moment the metal has come down to the boiling point. Hence $itz = vl$, and $z = \frac{vl}{it}$.

Also as above stated, the temperature t can be found when z is known, thus, $t = \frac{vl}{iz}$.

Numerous experiments on several branches of the subject, have already been made, and others are in progress, the whole of which will, in due time, be laid before the public.

FRANKLIN INSTITUTE.

Committee on Science and the Arts.

REPORT ON MR. PECK'S METHOD OF PROPELLING BOATS.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Plan of Propelling Boats, invented by Mr. J. Peck, of Oakland, Jefferson County, Tennessee.

REPORT:—

That the inventor proposes to employ what he terms a *multiplied crank*, attached to an axis made to revolve horizontally by some power not indicated in the sketch before us. The several wrists of the compound crank are to have either setting poles or hooks attached, one to each wrist, which poles or hooks are to act successively in urging the boat forward, by applying, when poles are used, to the bottom of the canal, or stream, and, when hooks are substituted, to a rack or rope, extending the whole way on the shore. Coiled springs are to be placed in some part of each pole, to prevent the effect of sudden and violent impulses. When the pole is used to apply to the bottom, a species of foot, made of three or four strips of metal, attached by hinges to the lower end of the pole, are to spread out and present a large surface to the soft bottom of the stream, to avoid sinking deep into the mud.

The slight sketch in the hands of the committee does not show any provision for guiding and directing the poles, nor obviate the difficulty from unequal depths on the two sides of the boat, when poles are used on both sides.

The method appears less suited to a rail-way than the rack-rail already in use, in connexion with toothed wheels, to insure the advancement of locomotive engines.

It seems unlikely that this plan will supersede the more simple methods already used for propelling boats, unless under very peculiar circumstances, and with some arrangements for obviating the practical difficulties which are not indicated in the sketch before us.

By order of the committee.

WILLIAM HAMILTON, *Actuary.*

March 13, 1834.

REPORT ON MR. B. DUGDALE'S WIND-MILL.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Horizontal Wind-mill, invented by Mr. B. Dugdale, of Burlington, N. J., REPORT:—

That the machine in question consists of an upright shaft revolving on a pivot in a step at its lower end; from which shaft, near its upper extremity, proceed, in one horizontal plane, ten equidistant arms; and from near the middle of the same shaft, proceed ten corresponding arms, also in one horizontal plane. Between each pair of corresponding arms, oblong rectangular frames of wire are hung, (at the extremities of the arms,) in such a manner as to admit of a horizontal vibration, through an arc of about ninety degrees. To these frames the sails are attached by small rings of wire, which can slide up and down the vertical bars of the frames.

The operation of raising the sails is performed by means of cords, one of which is attached to the stretcher at the upper end of each sail, and passes through a pulley at the extremity of the upper arm, along that arm to the shaft, and down the shaft to a collar sliding on the same. When this collar, to which all the cords are attached, is depressed on the shaft by means of a lever, all the sails are raised simultaneously. Again, when the collar is elevated, the cords become slack, and the sails drop by their own weight.

The vibratory motion allowed to the frames which support the sails, is so regulated that the sail on one side of the shaft, present their surface to the wind, while those on the opposite side offer their edges only: the efficiency of the machine is due to this arrangement.

Your committee deem it unnecessary to expatiate upon the merits of this wind-mill, or to discuss the patentee's claim to originality in his invention; but will merely refer all who are interested in the subject, to the Repertory of Arts, and to the Edinburgh Encyclopedia, in which they will find described several mills operating upon the same principle; some of which closely resemble this one in the details of their construction.

By order of the Committee.

William Hamilton, *Actuary.*

March 13*th*, 1834.

REPORT ON MR. SMITH'S COMPASS NEEDLE.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination an improved compass needle, manufactured by Mr. —— Smith, of Washington City, REPORT:—

That they have examined the needles submitted to them for that purpose by Mr. Trotter, together with the pamphlet of Mr. Smith, entitled "An Improvement," &c. and the notice of the patent for this improvement in the Journal of the Franklin Institute.

The claims in regard to the needles, appear to be,—

1. To a method of magnetizing them by percussion with what is called an electric rod.

2. To the removal of the influence of irregular magnetic distribution, and of local attraction, by "shifting feeders."

In regard to the particular method used by Mr. Smith, of conferring magnetism by percussion, the committee have no precise information, the needles not having been presented for their examination by the inventor himself, and no adequate description having been published of the details of his method. The general fact is well established in science, and testimony from various quarters speaks well of the application of it by Mr. Smith. Respecting the efficacy of the small pieces of soft iron termed "feeders," shifting upon the magnet, and usually placed near the poles, the committee inquired and refer to the subjoined experiments for the data upon which their opinion has been formed. In these experiments they availed themselves of the kind assistance of Prof. Henry, of Princeton, who was, at the time they were making them, on a visit to our city.

The first object was to ascertain whether the feeders added to the intensity of the magnetic force in the needle.

For this purpose the needle, furnished with its feeders drawn out to the marks on the ends, was suspended by a bundle of fibres of raw silk, free from twist. It was placed over a divided circle that its deviation from the magnetic meridian might be observed. Drawing it out of that meridian, it was made to vibrate, and the vibrations noted, when they had diminished so as to reach a certain extent. The mean of one hundred and twenty vibrations gave for the time of ten vibrations 80.47 seconds.

The weight of the magnet furnished to the committee, was, without the "feeders," 532.1 grains. The feeders weighed together, 13.9 grains.

For these iron "feeders" two pieces of brass, of nearly the same weight and form, were substituted, that the mass of the needle might remain the same; the brass pieces were placed in the position formerly occupied by the feeders, and the needle was then vibrated.

The brass feeders were lighter than the iron ones by .1 grain. From two series of experiments of one hundred and twenty each, the time of performing ten vibrations in this latter case was 79.87 seconds.

By the well known law expressing the relative horizontal intensities of the magnetism in these two cases, viz: that the forces are inversely as the squares of the time of vibration; the intensity in the first case was to that in the second as 79.87^2 to 80.47^2, or as .98 to 1.

The force of the magnet, instead then of being increased by the feeders, is slightly diminished by them. Your committee must observe here, that it seems to them that this result is what should have been expected from placing a piece of soft iron within the poles of the magnet.

The next point to be examined was the efficacy of the "feeders" in preventing the effects of local attraction. This might be inferred

from the results just given, but the committee preferred to subject it to direct experiment.

The same needle before used, was placed upon a steel point, fixed in the centre of a graduated circle. A mass of soft iron was brought to a measured distance from the needle when the "feeders" were on; the deflection produced was noted; the "feeders" being removed, the deflection produced by the same mass in the same position, was ascertained. These experiments the committee did not consider susceptible of the same nicety which was used in the first inquiry. The piece of iron was a rectangular plate, nineteen and three-eighths inches long by six and three-eighths wide, and weighing twenty-four pounds. The following results were obtained, and may be considered to approximate within about one-quarter of a degree of the truth.

When the iron plate was placed with its longest side making an angle of about forty degrees with the axis of the needle, the least distance from the south pole of the needle, six inches,

With the "feeders" on, the deflection was $18\frac{3}{4}°$.
With the brasses on, " $19.°$

The plate was now brought to half the distance above stated.

With the "feeders" on, the deflection was $31\frac{1}{4}°$,
With the brasses on, " $31\frac{3}{4}°$.

The proportional difference in the deflections with the feeders on and off, is, in the first case, one in seventy-six, and in the second, one in about sixty-four. These numbers are to be considered as merely approximate, but they serve to show that the needle is less deflected with the "feeders" on, than when they are off, a result agreeing with the conclusions to be derived from the first experiments, which showed that the magnetism was weakened by the "feeders." If the magnetism had been entirely destroyed, the deflection would have been nothing. The needle subjected to experiment was, in fact, a very weak magnet, and the feeders made it still more feeble.

In the Transactions of the Irish Academy for 1788, a plan is proposed "to preserve the magnetism, and consequently the *polarity*, of the needle," by having it "cased with thin, well polished, soft iron, or else to have it armed at the poles with a bit of soft iron." Capt. O'Brien Drury, by whom this suggestion was made, modestly submits his invention to the judgment of those who are qualified to appreciate its merits, and we conceive that this judgment may be considered to have been formed by the neglect of the invention during the forty-six years which have elapsed since its publication. In the plan before the committee, the needle is not entirely cased, but is furnished with shifting bands of soft iron.

By order of the committee.

William Hamilton, *Actuary.*

March 13, 1834.

REPORT ON MR. W. HENDERSON'S CHART OF COMMERCIAL WEIGHTS.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Chart of Commercial Weights, submitted by Mr. William Henderson, of Philadelphia, Penn., REPORT:—

That this Chart comprises scales of comparison of the weights of the principal commercial cities of Europe, and other parts of the world.

Scales of the ancient weights of France and Holland, being those most generally referred to in books of science, are also given.

On the left of the scales the names of the countries or cities are printed, and also the denomination of weight into which the scales are divided; as pound, rotoli, kilogrammes, &c.

The divisions on the scales are numbered at every ten.

For facilitating the comparison of weights of different countries, meridional lines are drawn across the scales at convenient distances.

Where different weights are used in the same country, different scales are, for the most part, given; as in the United States of America, one scale is given of pounds troy, and another of pounds avoirdupois. The troy scale extends from 0 to 219 pounds, and the avoirdupois scale, from 0 to 179 pounds; and within this compass, the comparison of weights of different countries is made by taking equal distances on the respective scales, from 0, or from the nearest meridional line, to the weights given and required.

The committee are of opinion that the Chart of Mr. Henderson will be found useful in commercial establishments, but would recommend that the meridional lines should be made to correspond with definite divisions of the avoirdupois scale, as by that arrangement, the comparisons could be made by a simple inspection of the Chart.

By order of the committee.

WILLIAM HAMILTON, *Actuary.*

April 9*th*, 1834.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN APRIL, 1834.

With Remarks and Exemplifications, by the Editor.

1. For a *Planting Plough;* Benjamin Hussey, Jonesborough, Washington county, Tennessee, April 1.

This machine is intended for dropping corn, or other grain, into ground which has been prepared for it. There are to be two wheels with their axle, and hounds for the draft. These are to sustain a hopper, into which the grain is to be put. A piece of sheet iron, properly perforated, passes along the bottom of the hopper, and this is to be touched by cogs projecting from one of the wheels, which cause it to drop the grain at regular distances, which distances may

be determined by the number of the cogs, &c. A share is so fixed as to cover the grain.

There is no claim made, although it can scarcely be unknown to the patentee that there have been numerous drill ploughs, and seeding machines made, and that some of them resemble the one before us in many particulars.

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2. For a *Machine for Pegging Boots and Shoes:* Nathan A. Fisher, Westborough, Worcester county, Massachusetts, April 3.

The apparatus here patented is intended to cut and drive the pegs into a shoe one at a time, the pegs being made from a strip of wood of the proper length and thickness, and sharpened at its lower edge. A plate of metal, of the form of the sole, is to be fixed thereon, and this plate is to have notches in its edge, like saw teeth, to serve as guides for the pegging awl. The instrument with which the holes are to be made, and the pegs driven, consists, in part, of a hollow tube, like a piece of gun barrel, five or six inches long, into which is fitted a punch, or piston, borne up by a spiral spring, and having on its lower end an awl, and a peg driver, at such distance from each other as the pegs in the shoe are to be placed. Although some pains have been taken to describe the machine, we should be unable to construct one from the description given, even with the aid of the drawing. Perhaps, were we to examine the model, the operation might be made plain. The whole appears to be considered as new, no claim being made to any particular part, nor indeed to the general arrangement of the whole.

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3. For *Promoting the Draft in Chimneys;* Elijah Skinner, Sandwich, Strafford county, New Hampshire, April 3.

In the mason work at the back of a common chimney fireplace, two small apertures, or flues, are to be made, about eight inches apart, and commencing about six or eight inches from the hearth; these are to extend up nearly as high as the mantle, and on the top of the apertures thus formed, two short metallic pipes, of two or three inches diameter, are to be fitted, and on these are to be placed similar pipes, extending up the flue, from two to four feet. Dampers are to be placed in these pipes, to regulate the draft.

The claim is to "the introduction and arragement of said metallic flues and pipes, into the channel of the common chimney, as conductors of heat, in such a manner as to rarify the air in said channel, and produce a stronger draft of smoke with a small quantity of heat taken directly from the fire."

We do not perceive any difference between the effect to be produced by this plan, and that which would result from lessening the flue, which may be done to greater advantage, especially where anthracite is burnt. There is in this city (Washington) a house recently erected, in which the flues of the fireplaces in two contiguous parlours differ very much in size, one of them being of the usual dimensions, the other but seven inches square, or rather less; this latter was so built at the urgent recommendation of the writer; it is

contained within the thickness of the wall, and is found to draw better than the larger one, not the slightest portion of the gas from the anthracite escaping into the room. The bricklayers prophesied that it would not answer, but they were mistaken.

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4. For an improvement in *Harrow Teeth;* Perry Prettyman, Georgetown, Sussex county, Delaware, April 3.

The claim made in this patent is to "the peculiar form of the tooth as described; more especially the angle of inclination of the planes of the wings, and of their edges to the shank, the sharp edges formed at their juncture continuing up the shank, and the wings of the fluke being made at right angles to each other or nearly so."

It is probable that the peculiar form described with much minuteness in the specification, may be a very good one, but it is certain that it may be materially departed from, so as to remove it out of the range of the patent, and yet answer the same purpose. There have been so many near approaches to it in the numerous cultivator teeth which have been made, that we think it would be a difficult task, without something more definite, to draw the line at the point where the patent ends, and the public right commences.

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5. For a *Truss for Hernia*; Thomas Stagner, Madison county, Kentucky, April 5.

We have in vain looked for a single novel feature in this truss, which is one of the most ordinary kind. The pad is to be of soft wood, and a strap attached to the spring which passes round the body, is to hook on to it; the old fashioned crotch strap is also used to keep it in its place. There is no attempt made to the designating of any part, as new and we have never seen an instance in which such an attempt would end in a more signal failure.

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6. For a *Sofa Bedstead;* Francis Breckels, city of New York, April 5.

Sixty or seventy years ago, it was much the fashion to make sofa, or settee, bedsteads; the principal inducement to which, in Europe, was the frequent occupancy of a single floor by a family, rendering it desirable to economize room, as well as to keep up appearances, where every apartment must contain its bedstead. Various attempts have been made to introduce similar articles here, but with little success; those who are in situations which render it desirable to keep up a show of gentility, are seldom so cramped for room as to render it necessary to mask their bedstead under the guise of a sofa, or a bureau; besides which, in a warm climate, teeming with life, it is very desirable that the bedstead should be as simple as possible in its form, or its name will be *legion;* this latter consideration, we feel assured, is sufficient, alone, to put a veto upon the general use of the article under consideration.

The patentee, after describing the manner in which he constructs his sofa, so that it may be unfolded into a bedstead, claims "the improvement of turning over the seat in such a manner as to form the

sacking bottom from the back part of the sofa frame, over and across the bottom of the seat."

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7. For an *Amalgamating Mill, for separating Gold from other Substances;* James Bogardus, city of New York, April 7.

The patentee states that the modes of amalgamation heretofore pursued do not enable the mercury to collect all the particles of gold, more especially in those cases where it is contained in pyrites, but believes that the machine invented by him will effect this object in a perfect manner; it is constructed as follows:—

A plank of six or seven feet in length, eighteen inches in width, and three in thickness, is to have a zig zag, or serpentine, channel sunk on one surface of it, which channel may commence and terminate at the distance of a foot from the ends of the plank; it may be about four inches wide, and sunk to a depth of two inches. This plank is to be made perfectly flat, so that a second, of similar dimensions, may, when bolted on to it, make a water-tight joint, under a certain degree of hydrostatic pressure.

An excavation, to receive two mill plates, is to be made at one end of the above described channel; these mill plates are to "consist of two circular sheets of copper, say one-fourth of an inch thick, and about ten inches in diameter. The excavation is to be made oval, as the two mill plates are not to be concentric; the length of the oval is to exceed its width about one-third. The lower mill plate is to have a pin projecting from the centre of its under side, which passing into a socket formed in the plank, allows it to revolve, and there are to be four or five holes, of about an eighth of an inch in diameter, drilled through this plate, for the free passage of mercury with which the channel is to be nearly filled.

The upper mill plate is to have a circular hole in its centre of an inch or more in diameter, and to this is to be secured a cylindrical tube of twelve or fifteen feet in length, through which the ore, broken into small pieces, and mixed with water, is to pass down between the plates. The lower end of this tube turns in a collar, and it may be driven by a whirl and band at its upper end, where it widens out into the form of a funnel, to receive the ore and water. The tube must be enclosed to nearly its upper end, in a water-tight case, attached to the upper plank.

The principle upon which the grinding plates operate is explained in our notice of a patent obtained by the same gentleman, on the 18th of January, 1832.

The far end of the channel terminates in a small well, or excavation, in the lower plank, above which the upper plank is perforated so as to allow the water, and refuse ore, to rise up by the hydrostatic pressure, and be discharged. This opening may, if necessary, be surrounded by a rim, so as to increase the depth of the well. When in use, this end of the machine is to be elevated a few inches above that in which the mill plates are contained.

"The principle of this invention consists in the combining the principle of said Bogardus' said universal mill with a channel nearly

horizontal, of convenient length, terminating in a well capable of holding a large portion of the mercury which the channel will contain, with a vertical tube over the plates, of a height and capacity capable of containing water sufficient, by its own power, to force its way through the mercury in said channel, the most expedient form of said channel being zig zag, or serpentine, and the most expedient position thereof being that of a slightly elevated or inclined plane, rising from the mill to the well.—Said well having a spout to discharge the water and ore, and other heterogeneous substances, and being elevated as aforesaid, so that the mercury will run back to the mill plates, whenever forced away from them by the power of the water."

We have given more space to this description than we can usually afford, and have been induced so to do from a knowledge of the fact, that a very favourable opinion has been entertained of the eventual success of this apparatus, by persons upon whose judgment some reliance ought to be placed; but it so happens, that although a good general judgment, and a good judgment in mechanics, are certainly not incompatible, still, they are very different things. It frequently falls to our lot to be placed in the situation of Micai, and such is at present the case. We see, or think we see, numerous objections to this machine, so numerous that we cannot here allude to the whole of them; nor indeed can we find space to state either of them fully.

We think the capacity of the machine altogether inadequate to the kind of business it is to perform; a tube of fifteen feet in length, and one inch in diameter, will admit but little ore, and will soon choak. The mill plates of ten inches, would do but little work could the ore be supplied to them, and, as they are to be made of copper, and to revolve in mercury, they will soon disappear, amalgamating therewith, like the gold. The holes through the lower plate, for the passage of mercury, will soon be stopped up, and cease to perform their intended function; and if the two planks can be bolted together, so as not to admit of the passage of mercury between them, we promise, when informed of this fact, to leave off prophesying.

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8. For a *Plough;* John Morford, Maysville, Kentucky, April 8.

We are rarely able to define the improvements made in the plough, as what are so called usually consist in minute changes of form, and in the mode of attaching the respective parts to each other; such is the case in the present instance, and we, therefore, leave a critical examination of it to those who may wish to make further *improvements.*

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9. For a *Printing Press;* Charles F. Voorhies, Newark, New Jersey, April 8.

This printing press is one which manifests much ingenuity in the contrivance of it, but it requires the aid of drawings to make its construction known, and at a period so prolific in improvements upon this important instrument, it appears that what is new to-day, may be superceded by the contrivance of to-morrow. In the art of print-

ing, the revolution has been as entire as in the business of locomotion, and books are produced as men travel upon rail-roads, by steam engines. We would insert the claim made by Mr. Voorhies, if, as is frequently the case, any tolerable idea of the machine could be collected therefrom, but as it refers to the previous description and the accompanying drawings, it would be unavailing.

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10. For an improvement in the *Mode of Steering Vessels;* John B. Holmes, Boston, Massachusetts, April 11.

The description of this improvement is quite brief, being comprised in less than a dozen lines. Upon the rudder head a segment of a spur wheel, about two feet in diameter, is to be secured. A pinion wheel, eight inches in diameter, more or less, is to take into this segment wheel, the shaft upon which the pinion is placed turning in a suitable frame, strongly bolted to the deck. A second wheel, of about two feet in diameter, either spur or bevil gear, according as the steering wheel is to be vertical or horizontal, is to be placed on the same shaft with the pinion. Nothing is said about a second pinion to gear into this second wheel, which is, of course, an accidental omission, as such a one there must be, and indeed it is shown in the drawing.

The claim is to "the above improvement, whether the power be applied by gear wheels, or by metal or other bands, and whether the same be used upon or between decks,—in all cases where two or more shafts are used to form a compound lever."

The same principle has been so frequently applied to steering, that a claim like the foregoing, will be found much too sweeping, more especially as it claims not only what is described, with its modifications, but all possible arrangements where two or more shafts are used.

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11. For a *Printing Press;* William R. Collier, city of Washington, April 11.

This printing press is intended to be worked either as a power or hand press; the description given of it is very full, occupying several sheets of paper, and referring to the drawings throughout. Were we to attempt to epitomize this description so as to convey a clear idea of the construction of the instrument, we must devote more time and space to it than appear to be due, as, according to our impression of its action, it will not rival the presses now in use, either in rapidity of action or accuracy of execution; when we learn that we are mistaken on these points, we will say more about it.

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12. For a *Stove for Cooking and other purposes;* Thomas Whitson, Roxbury, Norfolk county, Massachusetts, April 11.

The specification commences by informing us that "the improvement claimed consists in causing the flame and smoke of the fire to come into contact with the oven, and surround it on every side, and in such a manner as not to obstruct the use of the boilers at the same

time; and in making the grate portable, so that wood, coals, or other fuel, may be equally well used for heating the same."

There are so many stoves whose chief merit is thought to consist in causing the heated current from the fireplace to surround the oven on all sides, that it is a little surprising to find this now claimed as a distinguishing characteristic of a new stove. (See the specification of Harriman's stove, p. 272.) The form of the apparatus, as shown in the drawing, does not differ materially from some which have preceded it, and considering the great variety which have been patented, it is nearly impossible for any one to avoid this kind of collision. If the stove before us is susceptible of defence as a new invention, we think that it could prove so only under a claim to the particular arrangement of its parts, there being little or no novelty in either of its individual features.

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13. For *Preventing the Loss of Lives in the Explosion of Boilers on board Steam Boats;* Timothy Newhall, jr., Lynn, Essex county, Massachusetts, April 12.

This is one of those queer contrivances which are occasionally born of a kink in the understanding, are afterwards nursed until they find their way to the Patent Office, where they rest in peace, and are recollected only from the reading of their *hic jacet.*

That our readers may have all the means which we ourselves possess of forming an accurate judgment upon the subject, we will place before them the whole sum and substance of this contrivance, as nearly as may be in the words of its author.

"The invention consists in having water, or any simple or compound liquid, between the boiler and the quarter deck, and between the boiler and the forward or main deck, and between the boiler and the after cabin, and between the boiler and the forward cabin, and between the boiler and the after hold, and between the boiler and the forward hold." This water is to be enclosed in wood, or other substance, extending from side to side of the boat, and rising seven feet above the deck. There is thus to be two walls of water, dividing the boat into three parts. The thickness of the wall of water is to be proportioned to the size of the boiler, "and the above named contrivance will lessen the danger if the boat should take fire."

Let others write the commentary.

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14. For an improved *Water Chute, and Driving Wheel;* Lewis Waterbury and Talmage Waterbury, Malta, Saratoga county, New York, April 12.

The alleged improvement which forms the subject of this patent, is applied to the flutter wheels in common use for saw, fulling, and other mills, and we are informed that the patentees have proved experimentally that it will produce a saving of one-fourth of the water, or, which is the same thing, enable the mill to perform one-fourth more work. Although this may have been the case with their own mill, we really believe that it will not hold good with others, and are

apprehensive that the saving which they have experienced, has resulted from other causes than those which they have assigned.

One of their improvements consists in the mode of letting the water on to the floats of the flutter wheel. The curve of the chute is not to close in upon the edge of the buckets until the latter have arrived at a point midway between a horizontal and perpendicular line, drawn through the gudgeon of the wheel; this, it is said, will allow the water to act upon a greater number of buckets. The principal improvement, however, consists in the addition of a second wheel, which is to be acted upon by the water after it leaves the first; for this purpose it is to have a descent of, at least, one inch in a foot. The first wheel may be from twenty to thirty-two inches in diameter, and have from five to twelve buckets. The second, which is an undershot wheel, should be at least three feet in diameter; and to insure the concurrent action of the two, there is to be a pulley upon the flutter wheel, of one-half its diameter, and a groove upon the periphery of the second wheel, which pulley and groove are to receive a chain, operating as a connecting band, tightening pulleys being used to prevent its slipping.

If this second wheel should enable the apparatus to overcome the friction from the chain, and the other additional rubbing parts, it will effect more than we anticipate, as, instead of an increase of one-fourth in the work performed, we should apprehend at least an equal balance on the other side of the account.

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15. For *Steam Vacuum Pumps;* Isaac Barnum, city of New York, April 16.

The apparatus here called a steam vacuum pump, is intended for the raising of water, which water, from some expressions used, we suppose, is intended to turn a mill wheel; be this as it may, the instrument is no other than Savary's steam engine, with two condensers, which are to be alternately filled with water and steam. The arrangement of the respective parts differs no more from engines upon that plan, as they were formerly constructed, than they did from each other; nor does it present any thing which appears to us to deserve the name of an improvement. Even for the simple operation of raising water, to which purpose it is better adapted than to any other, it has been abandoned for more than a century, and there is but little probability of its ever being again used, excepting as a philosophical toy. Several patents have been obtained for improvements in the steam engine, by which its operation was said to be much simplified, the simplification consisting in carrying it back to the days of Savary, and divesting it of those contrivances by which it has been rendered the most efficient of all the motive instruments.

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16. For *Roping and Spinning Cotton;* James Chesters, Cumberland, Providence county, Rhode Island. An alien, who has resided two years in the United States; April 16.

There is a good drawing accompanying the specification of this machine, with written references thereto, and in these the whole

description may be said to consist; without the drawing the things claimed cannot readily be explained. The bobbin upon which the roping is to be wound, is turned by a roller beneath it in the usual way, and the roping is to be carried from end to end by means of a horizontal shaft above the bobbin, which has upon it a right and left handed screw, between the threads of which a guide piece, or pointer, is to play backwards and forwards. The application of this screw is claimed, as is also a revolving case which covers the apparatus, and a loose pulley to regulate the tightness of a band.

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17. For a *Back for a Blacksmith's Forge;* John Howe, Alna, Lincoln county, Maine, April 16.

This forge back is intended for heating the air before it enters the fire, and consists of a cast iron box, so similar to others which have been patented, as to possess no novelty, and so inferior to some of them in construction, as to lay no just claim to comparative utility.

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18. For a *Machine for Sawing and Boring;* B. F. Goodspeed and D. H. Wiswall, city of New York, April 16.

Sawing and boring machines are in common use in many of our manufactories, and have been varied in so many ways according to the nature of the work to be executed, that little appears left to be done in this respect; in proof of this, the patents which have been taken for such machines, have, usually, offered little or nothing that was new, but have been merely such varied arrangements of things, previously well known, as exhibited nothing of invention. In the machine before us, the claims made are confined to such particular arrangements; a course which appears to be the only safe one in such a case. "The improvement consists in the manner of placing the cross heads of the vertical saws on a semicircular standard of cast iron or brass, cast with flanches on the sides for the clasps that are fastened to the cross heads to play up and down on; and also with a flanch at right angles with the side flanches on the circular side of the standard, of the proper thickness and length for the purpose of securing the standard to a table, or plane, which rests on a frame of cast iron of convenient height and length for the work intended to be performed." "We claim the aforesaid method of hanging the vertical saws, as well as the mode of raising and depressing the auger."

Although there is a good perspective drawing of the machinery, the parts which are claimed are not clearly explained, or distinctly represented; a workman, therefore, who should attempt to build a machine from the drawing and specification, would have to resort to his own inventive powers in order to complete his work.

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19. For *Self-igniting Cigars;* John Marck, city of New York. An alien, who has given notice of his intention to become a citizen of the United States; April 16.

To the end of the cigar a paper box, or receptacle, is to be attached, containing any of the chemical compounds which ignite by fric-

tion or percussion, to which is to be added a piece of tinder, or spunk, to insure the ignition of the tobacco.

If care be not taken these cigars will become self-smoking as well as self-igniting; for it has frequently happened to boxes of prepared matches to take fire from some accidental force, when the whole have been rapidly consumed. As these cigars will, for a while, be objects of curiosity, they will have their day, and may thus, possibly, answer the purpose of the patentee; more than this we do not anticipate.

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20. For a *Diving Suit;* Nathaniel Wolcott, Sidney, Delaware county, New York, April 18.

The suit described is to be a covering for the body, made of water proof leather, oil cloth, or cloth coated with India rubber. The description of its construction, with that of a cap for the head, furnished with holes closed by glasses for the eyes, and tubes to supply air, differs so little from what has been long known and used, that we cannot tell what it is intended to patent, particularly as the description is altogether general, without any attempt to claim, or to point out, what is considered as new. There is a particular description of the straps, &c. by which the suit is to be secured in its place, but these find no place in the drawing, nor indeed is the specification accompanied by any thing which can be properly so called.

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21. For improved *Bellows;* James Robe, Morgantown, Monongalia county, Virginia, April 17.

The bellows here described are intended for a smith's forge, or, when of sufficient size, for furnaces, &c. The body of the bellows may be a square wooden trunk, four feet high, and two feet on each side. At the lower end, a piston, or plunger, of plank, surrounded on its edges by some elastic substance, and furnished with a valve opening inwards, is to be worked up and down by a lever. A partition, or diaphragm, crosses the middle of the trunk, just below the blast pipe, and has a valve also opening upwards. Above this there is another piston fitting the trunk like the former, with a guide rod above it, to keep it horizontal; this descends by its own weight, and takes the place of the upper board in the ordinary bellows. The other parts require no description, and those who know any thing about blowing machines, will see that in the parts described there is no novelty. The patentee, however, appears to think that the whole is new, as he has not preferred any claim, but informs us that "the trunks may be made round, octagon, square, oblong square, or any other form that fancy may suggest."

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22. For an improvement in the *Throttle Valve of Steam Engines;* Augustus S. Dawley, Boston, Massachusetts, April 18.

This throttle valve, instead of being in the usual form of a circular disk, operates like some slide valves, in which the valve and seat both consist of alternate bars and slots, the whole of which slots are closed or opened to an equal extent simultaneously; in the arrange-

ment now patented, however, the valve seat, instead of having its surface flat, is in the form of a hollow segment of a cylinder, and the valve is ground to fit it, whilst it works on pins in the centre of its curvature. When the stem of this valve is moved by the action of the lever, or rod, from the governor, all the slots opening or closing at once, the action of the steam is more immediate, with a small degree of motion, than with the ordinary disk valve, and the engine is in consequence more quickly advanced or retarded, and a more equal action insured. The claim is to "the construction of the throttle valve as above described, with openings, or slots, for the purpose of a quick regulation of the admission of the steam from the boiler to the cylinder."

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23. For a *Machine for Pressing Puddlers' Balls;* William Jones, Haverstraw, Rockland county, New York. An alien, who has resided two years in the United States; April 18.

This machine is intended to press the balls in the puddling of iron, instead of hammering them. It consists of a beam of cast iron, called the squeezer, which is moved on a pivot by means of a lever, acted on by a crank; there is a cast iron bed upon which the balls to be pressed are placed. The squeezer is of a triangular form, and may be single or double; when double, it resembles two triangles joined at their bases. The general construction of the machine, and the mode of using it, are presented in very general terms, and as the drawing does not represent the parts sufficiently in detail to enable us to understand it completely, we must leave it to those who are adepts in the business to which it is to be applied.

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24. For an improvement on the *Rack Wrench,* invented by Henry King; Solyman Merrick, Springfield, Hampden county, Massachusetts, April 18.

(See specification.)

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25. For *Heating and Applying Air to Blast Furnaces;* Isaac Tyson, jr., city of Baltimore, April 18.

(See specification.)

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26. For an improvement in the *Fly Net for Saddle, Gig, and Carriage Horses;* Henry Korn, city of Philadelphia. First patented September 12, 1829. Patent surrendered and reissued April 19.

We noticed this patent under its proper date, and pointed out what we deemed defects in the specification; these the patentee has essayed to remove by a reissued patent, in which he claims "the making of fly nets for horses, by weaving, plaiting, or braiding, from a material not heretofore employed for that purpose; namely, from braid of silk, worsted, cotton, or other fibrous substances; which braid is to constitute the ribs, or thongs, of the said fly net. I also claim the uniting together of the longitudinal straps, and the ribs, or thongs,

by weaving, plaiting, or braiding, whether the material used for the ribs, or thongs, be twisted cord, or braid."

27. For an improvement in the *Fly Net for Saddle, Gig, or Carriage Horses;* Henry Korn, city of Philadelphia. First patented December 8, 1831. Patent surrendered and reissued, April 19.

"All that I claim as my improvement," says the patentee, "and for which I ask the present patent, is the making of the fly net for the neck and shoulders of the horse, with two straps inclined towards each other, in the manner and for the purpose herein described; the material of which my nets are made, and the manner of connecting these materials by weaving, plaiting, or braiding, being the same as that described and claimed by me in my patent of September, 1829."

It is unnecessary to point out to any one the neatness, lightness, and beauty of the fly nets now used for horses, and manufactured under the foregoing patents. They appear, indeed, so perfect as to leave nothing to desire upon the subject, excepting it be the miraculous aid of some kind Saint, who would drive away those troublesome insects by which this appendage to harness is now rendered necessary.

28. For a *Machine for Hulling Cotton Seed;* Henry Hubbard, Claremont, Sullivan county, New Hampshire, April 19.

The seed is to be put into a feeding hopper which opens over what are called cutting cylinders; within the feeding hopper there is a revolving cylinder, set with teeth, spirally, to feed the seed to the cutting cylinders. These cutting cylinders are of iron, and have their circumferences worked into broad flutes, passing spirally, there being five of them in an inch, each one-sixteenth of an inch deep. These are driven by proper gearing, and are intended to break and loosen the hull; but to complete the process, the seed falls from them, and passes between a cylinder and concave, both of which are thickly set with teeth, arranged spirally; the latter cylinder is called the beating cylinder, and is one foot in circumference; this, it is said, will completely separate the hull from the seed, which is cleaned by passing into a sieve, and being subjected to the action of a fan.

The perfect novelty of all the parts of this machine, is something more than doubtful, yet we are left to conjecture what it is intended to patent, as no claim is made.

29. For an improvement in the common *Furnace Stove;* James Atwater, New Haven, Connecticut, April 19.

The stove designed is of the ordinary vertical, cylindrical form. From the head, or cap, of this stove, two draft pipes are to project horizontally from opposite sides; these are then to bend down and extend as low as the floor, parallel to the body of the stove, on each side of it; they are then to bend back horizontally, and afterwards to ascend vertically, and both to unite in one common pipe of larger dimensions, which is to lead into a chimney, or other proper place

of exit. There are to be valves in the respective pipes to regulate and direct the draft, as may be desired; and some directions are given respecting the grate bars, and other appendages, which do not affect the general principle.

The claims made are to the adjustment of the several pipes and valves, so that the draft may be made to pass directly upwards through the fuel, or have an indirect course through a series of pipes near the body of the stove; or downward through the fuel, and a rear pipe, and ultimately pass off in the usual manner. The combination of any two of said drafts is also claimed, but the particular parts, individually, are not claimed as making any part of the invention.

We could find some stoves, patented and unpatented, with pipes and valves so arranged as to bear much resemblance to the foregoing, and we greatly err if the same principle does not obtain in some of the patented contrivances of Mr. Atwater himself.

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30. For a *Washing Machine;* Philip Horney, Randolph county, North Carolina, April 21.

This washing machine is the ordinary revolving barrel, and the claim made is not to this contrivance, but to "the mode of grooving or fluting the cylinder on the inside, and making use of a revolving roller, wallower, or reel, within, to rub and press the clothes."

This latter appendage has no claim to novelty; and the former, if new, is of but little importance standing alone.

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31. For a *Machine for Filing Accounts;* Samuel Argell, Providence, Rhode Island, April 22.

Two boards, each ten inches long, and three and a half wide, are to contain the folded accounts between them. Upon the upper board there is a small cylinder turning between two standards, to which cylinder, the ends of a strap, or belt, are fastened; this strap passes through a slot made edgewise in the lower board. One end of the cylinder has a ratchet and click attached to it, and the other a thumb piece for turning it. The papers are to be placed between the two boards, and upon turning the cylinder, the strap will wind round it, and draw the boards together, when they will be held by the ratchet. One end of the upper board has a hinge and button, allowing it to be turned up to examine the labels, without loosening the strap.

This little machine will undoubtedly accomplish the object for which it is constructed, but it will hardly come into use where files are numerous, and referred to at distant periods. The cylinder and its appurtenances will render it inconvenient to stow away the files upon each other; where these are few in number, however, it may be considered as a neat and useful article.

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32. For *Igniting Gunpowder in Discharging Artillery, &c.;* Alexander Jones, Mobile, county of Mobile, Alabama, April 22.

Gunpowder is to be ignited in the blasting of rocks, the firing of artillery, &c. &c. by means of hydrogen gas and spongy platina.

The mode in which this is to be effected can scarcely be said to be described by the patentee; for, although not quite uninformed on the subject of chemistry, we should have to invent the apparatus to be used, after making ourselves masters of all the directions afforded in the specification, before we could set fire to gunpowder, in the way proposed. We are merely told that the hydrogen is to be generated in the usual manner; that it is to be conducted along a tube of lead of any desired length, at the end of which there is to be a small piece of platinum sponge in contact with the gunpowder; that the gas is to be passed into the tube by means of a cock, and that the explosion will then be almost instantly effected. Those acquainted with chemical manipulation, need not be informed of the inadequacy of these directions; and to those who are not so, any animadversions respecting them would be uninteresting.

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33. For improvements in the *Mode of constructing Steam-Boats, and other Vessels, and in the manner of propelling them;* Anthony Plantou, city of Philadelphia, April 23.

Two or more hollow trunks are to be made perfectly water tight, and as long as, or a little longer than, the boat; they may be rectangular, and tapered, or pointed, towards their ends. These are to be placed parallel to each other, one on each side of the boat when there are two, and one also in the middle of it, should there be three. Between these, transversely, there are to be hollow water-tight cylinders, turning on axes, or gudgeons. The number of these cylinders is to be regulated by their diameter, and the length of the boat; they, however, are to be as numerous as these dimensions will allow. Each of the cylinders is to be surrounded by paddles, or floats, from two to six inches in width, and which are to extend from end to end of the cylinders. These hollow cylinders are to concur with the trunks in giving buoyancy to the boats; they are to be geared together, and acted upon simultaneously by the power employed. The boat, with its machinery, is to be elevated above these trunks and buoyant cylindrical propellers. In the trunks and cylinders there must be sufficient buoyancy to prevent the latter from dipping so deep as to interfere with the propelling action of the floats.

The patentee does "not claim to be the inventor of hollow cylinders surrounded with paddles, or floats, nor to be the inventor of hollow trunks to give buoyancy to a boat; nor to be the first who has found out the means of making unsinkable boats;" but what he does "claim, is the combination and arrangement of the several parts, as above described and specified, in order to obtain buoyancy, velocity, and safety."

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34. For improvements in the *Apparatus and Process forManufacturing the Prussiates of Potash and Soda,* and for other purposes; Felix Fossard, city of Philadelphia; an alien who has declared his intention to become a citizen of the United States, April 23.

The specification of this patent enters into very minute and extended details of the machinery and process to be employed, covering twenty-eight closely written pages, and referring to drawings of considerable complexity. This patent may be said to be supplementary to that obtained by the same gentleman on the 14th of December, 1832, and of which we gave some account at page 182, vol. xi. As we cannot furnish a detailed analysis of this specification in the space which we could devote to it, we shall pass it over altogether, referring those interested in the subject to the files of the patent office, merely remarking that we have seen no reason to withdraw the favourable opinion expressed by us respecting the former patent.

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35. For a *Marine Dress for Descending in the Water;* Fowler Smith, and Lewis S. Steele, Norfolk, Norfolk county, Virginia, April 23.

The description of this dress tallies precisely with that given in No. 20, the only variation named being the employment of brass screws, like hose screws, to attach the body of the dress to the cap and pantaloons. There is no claim, and as we have made some remarks upon the compeer of this patent, we refer the reader to them, with the exception of what relates to the drawing, that furnished in the present instance being sufficiently descriptive, and looking very much like some of the numerous engravings representing similar apparatus, in scientific works.

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36. For *Tempering Tanners' Fleshers, and other edge tools;* John Glenn, Champaigne county, Ohio, April 24.

Although there are but few processes in the arts which do not admit of improvement, there are some which are so well understood, that the changes by which they are supposed to be improved, are received with some scepticism by those who are well acquainted with the subject. The hardening and tempering of steel is one of the processes to which we allude; for effecting these operations, several patents have been obtained, the greater number of which are utterly worthless, and we see no reason for removing this new attempt out of the general list.

The flesher, we are told, is to be plated out of solid cast steel, and tempered by being heated to a dark cherry red, and held in water until perfectly cold. The flesher, or any number of them, is then to be placed in a cast iron box, and covered with oil, tallow, or other grease; this is to be heated for half an hour, as hot as it will bear without blazing, and then laid out to cool.

The foregoing contains the whole process, in which there is nothing new, and which, in many cases, will not answer the intended purpose, more especially as it is to be applied to "all other edged tools," which require very different degrees of temper.

Were all cast steel alike, it would, of course, all harden at the same degree of heat, but this is far from being the case; and besides this, "a dark cherry red" will be very different by day light, and in

the dark, and will vary with every degree of light admitted; the bath of grease, also, is very inferior to other modes now practised for giving a uniform heat in tempering, the fusible alloys being much more perfect. As to keeping the pieces in for half an hour, this is no more necessary than to keep them there for half a day. When brought to the proper heat, the steel will be at the same temper as it will if kept at the same degree for any length of time.

The patentee has made no claim.

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37. For *Hulling Clover-Seed;* William Rowe, Phillips, Somerset county, Maine. April 25.

A conical tub is to be made, and lined with perforated sheet iron, and within this, a conical core, or nut, is to revolve, having perforated sheet iron fixed spirally round it, forming a kind of screw. The chaff and seed are afterwards to be separated by sieves and a fan. All this, it will be seen, resembles what has been before done, and so far as a claim is concerned, we might infer that the patentee is of the same opinion, nothing new being pointed out.

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38. For a *Machine for Sawing Shingles;* John W. Smith, Montgomery county, Virginia, April 25.

The patentee claims the machine "according to the plan described, and the *model* deposited in the patent office;" which latter, we suppose, must be the principal reliance, as the description and drawing are very far from showing how the machine is to be used, there not being a word said about the kind of saw to be employed, or the mode of applying it.

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39. For a *Blacksmith's Striker;* William B. Dobson, Surrey county, North Carolina, April 25.

The hammer is to be brought down by placing the foot on a treadle, a chain or rope from which passes round a roller to which the hammer helve is attached; a spring above, with a rope or chain passing round the same roller, serving to raise it.

There is no great difference between this contrivance and that noticed at p. 172, vol. 13, as patented by Mr. Lewis Stripe, to which we refer.

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40. For a *Thrashing Machine;* Ebenezer Chandler, and Joseph A. Holland, Kennebec county, Maine, April 25.

This machine is intended principally for getting out clover or other small seeds, and consists of a convex cylinder, covered with perforated sheet iron, revolving within a concave cylinder, similarly covered, and divided into segments, so fixed as to give way in case of any extraordinary resistance. When used for wheat, &c., to which it appears to be but indifferently adapted, it is to be somewhat modified. Much pains are taken in describing the form and arrangement of the perforations in the two cylinders, but nothing is pointed out as new, the

whole being placed in the same point of view, as the invention of the patentees.

41. For an improvement in *Washers for Paper Engines;* Clark Rice, Watertown, Jefferson county, New York, April 26.

The manner of constructing the washing apparatus adopted by the patentee, is very minutely described in the specification. In some points it resembles that patented by Mr. Thomas Goucher, the specification of which may be found at p. 259, vol. xii.; but there are also considerable differences between them. The claim made is to the peculiar manner in which the vellum or wire cloth is kept free of rags, or pulp, in the various stages of washing, and in which the egress of water is accomplished; that is to say, by causing an extra pressure or current, and a gathering of head, by narrowing the passage, or otherwise compressing the rags in that part of the engine where the washer or vellum is placed; and also the combination and arrangement of the several parts of the machine by which the same is effected, as described and set forth.

42. For a *Thrashing Machine;* Richard P. Sutherland, Chatham, Columbia county, New York, April 26.

There is no pretension to any thing new in this thrashing machine, the specification of which would answer equally well for some score or two of others previously patented. Cylinder, concave, teeth, springs, hopper, &c. &c., are all old acquaintances, and all seated in their accustomed positions.

43. For a *Roasting Jack;* Ezra Whitman, Jr., Winthrop, Kennebec county, Maine, April 28.

This is a more complex and less convenient apparatus than the old fashioned English roasting jack, fifty of which have been brought into this country for one that has been used. The spit in this roasting jack is to be vertical, and to receive small cross bars, to which birds, chops, &c. may be suspended. It is to be turned by a weight, a rope from which passes round a drum. By an additional bevil gear, it is to be made to turn a coffee roaster, and the motion is to be regulated by a fly wheel, or by a pendulum, with its escapement. A claim is made to "the combination of machinery as above described, to turn meat, or coffee, whilst roasting; and particularly to the using one or more upright spits; and the addition or application of the coffee roaster."

44. For an *Endless Chain Rotary Pump;* John C. Pitts, Winthrop, Kennebec county, and Hiram A. Pitts, Livermore, Oxford county, Maine, April 28.

This is the old chain pump, "unanointed, unannealed," "as it was in the beginning." An endless chain is to pass round two pulleys, one above the pump, and the other at the bottom of the well, and upon this chain round disks of wood, about two inches thick, are to be

placed, the diameter of which is to be such as nearly to fill the bore of the pump at the lower end, where, for two or three feet from the bottom, it is to be somewhat smaller than above. Leather is to be nailed upon the tops of the buckets or pistons, so as just to fill this part of the bore.

After all this has been done, should the well be as deep as usual, one of the least efficient kind of pumps will be placed in it, which will afford more labour than profit. Those who read books of mechanical science, will not need any reference to pumps such as is here described. The patentees have very properly omitted to make any claim.

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45. For a *Screw Drill Stock;* Charles Babbitt, Taunton, Bristol county, Massachusetts, April 29.

This drill stock consists of a head, or handle, which may be of ivory, into which is fitted the upper end of a cast steel arbor, or shaft, which may be a quarter of an inch, or upwards, in diameter, and six or seven inches long. The part which fits into the ivory head is turned small, and revolves freely in it as in a collar, being kept in its place by a pin working in a groove. The drill fits into a socket at the lower end of the shaft. Grooves are cut upon the shaft, from end to end, forming a three threaded screw, and upon this is fitted a nut of brass, or other material, which, when taken between the finger and thumb, and worked up and down, causes the shaft to revolve. This apparatus is simple, neat, and ingenious, and, we suppose, is intended principally for the use of dentists, and for other purposes where but little force is required.

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46. For a *Machine for Hulling Clover, and Thrashing small Grain;* Henry Bangs, city of New York, April 29.

The wood work of this thrashing machine is framed together in a form somewhat different from that usually given to this part, but in other respects it offers nothing new; the first part of the claim is to "the general construction of the frame," which, had it stood alone, might have passed; but to this are added "the particular manner of building the cylinder, and the manner of breaking off the wind." This latter claim is to embrace "a board hung to the wind spout, which, when thrashing grain, is let fall against the slide board, and fills up the space, that no air may be drawn down that way to blow the dust against the person feeding."

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47. For a *Mill for Grinding Bark, Cracking Corn, Gypsum, &c.;* Milo J. Whiton, Amsterdam, Montgomery county, New York, April 30.

This is a cast iron mill, with the ordinary shell and nut, furnished with teeth, but so arranged that the patentee thinks it presents some novelty, which, however, is not of a very visible or tangible kind; but he claims "as original the oval like shape of the nut, and the equal

bevil on each side of the fine teeth, together with the spiral position in which the teeth are placed on the curb and nut."

48. For *Extracting Fur from Skins;* Levi Ward, assignee of Phebe Atwell, Marion, Wayne county, New York, April 30.

The process here patented is said to be adopted for the purpose of manufacturing the fur into yarn for making mittens, gloves, &c., and is as follows:—Apply alkali to the flesh sides of the skin, until the hair and fur become loose; then pull and remove the hair, and afterwards pull out the fur, which is to be dried, oiled, carded and spun.

What kind of skins and fur are to be thus treated, we are not informed; nor are we told what kind of alkali is to be employed, or the time or manner of its application—all which things should have been explained. In many instances lime is ranked with the alkalies, and it is that one which has been commonly used in the removing of hair and fur from skins; and in those which are to be tawed, it is applied on the flesh side, as pointed out in the foregoing specification.

49. For a *Self-Inking Machine,* applied to the Horizontal Printing Press; William J. Spencer, city of New York, April 30.

Those acquainted with the subject in question, are aware that several plans have been devised and patented for inking the form on the common hand press, without the employment of an additional hand. The present patentee, however, seems to be inclined to claim the first place among the contrivers of these machines, as he says: "I originally invented this machine in Canada, in the year one thousand eight hundred and twenty-eight, and have now brought it into easy and necessary use; by it the labour of an additional hand is saved, and the exertions of the pressman but lightly increased."

At least two patents were obtained in the United States in the year 1829, for the above purpose, and as these plans were carried into operation five years ago, it is not likely that the present patentee will be able to establish a prior claim, as, by his own showing, he has only "now brought it into easy and necessary use." If his claim is admitted, however, the first shall be last, and the last first, as he says, "I claim as new, and as my own discovery for the application of a self-inking machine to the ordinary horizontal hand press;—the ink trough, rollers, and straight edges as cut, are known and used before. I also claim for the contrivance, means of the combination of the cords, loose pullies, acting on the shaft, and catches and teeth by means of which is produced a continued revolution of the wooden roller in one direction by means of the action of the rounce, which moves backwards and forwards with the issuing and return of the bed of the hand press."

We hope that his machinery rolls on more smoothly than does his description of it.

Specifications of American Patents.

Specification of a patent for an improvement on the Rack Wrench patented by Henry King. Granted to Solyman Merrick, *Springfield, Hampden county, Massachusetts, April* 18, 1834.

To all whom it may concern, be it known, that I, Solyman Merrick, of Springfield, in the county of Hampden, and state of Massachusetts, have invented an improvement in the Rack Wrench invented by Henry King, and for which letters patent of the United States were granted unto him, on the 25th of October, 1832; and I do hereby declare that the following is a full and exact description of my said improvement.

The main bar, the slide, and the spring click, may be made in the same form and manner as those in the original Rack Wrench upon which this is an improvement; but instead of cutting the notches in which the spring click is to catch, directly upon the main bar, I make a sliding rack, of such length as may be necessary to regulate the distance of the jaws from each other, which rack I place in a groove on the upper side of the bar. Upon this sliding piece I cut teeth, or notches, to receive the spring click, either at equal or at graduated distances from each other. This sliding piece, or movable rack, is to be acted on by a screw, which must cause it to traverse backward and forward to a distance equal to that of the widest tooth in the rack. What I deem one of the best modes of arranging the parts so as to accomplish this end, is the following.

I make the shank of the bar, or that part of it which passes through the handle thereof, round, and form a square shoulder at the point where the square bar commences; over this round part I drive a turned collar, which bears against the square part of the bar, and there forms a flanch, which keeps one end of a nut, or ferule, in its place, which passes on to, and revolves freely against it. A groove is made through this collar, to correspond with that on the main bar, that the rear end of the sliding rack, before described, may pass through it. On this end of the rack, spiral grooves are cut, which match into the threads of a female screw cut upon the inside of the revolving nut, or ferule, just alluded to. This revolving ferule is then passed on to, and against, the aforenamed collar, being screwed round so that the threads on its inner surface may take on to spiral grooves, which form a segment of a male screw on the end of the rack. Another circular collar, of the same diameter with the former, which is equal, or nearly equal, to that of the revolving nut or ferule, is then driven over the shank, and against the nut, but not so closely as to interfere with its revolving motion. The wooden handle may then be driven on the shank, and rivetted in its place. The outer surface of the nut should be milled, that it may be the more readily turned round by the hand.

It will be seen that, by this arrangement, whenever the slide is placed to the nearest desirable point on the rack, the jaws can be readily and precisely adjusted by turning the nut.

Although I have pointed out what I deem to be the best mode of arranging the parts so as to adjust the sliding rack, I do not intend thereby to confine myself to this particular arrangement, but to vary the same in any way which is in accordance with the general principle or mode of action hereinbefore set forth, and by which a similar effect is produced; limiting myself, in my claim to improvement, to the addition of the movable or sliding rack, operated upon, and adjusted, by a screw. SOLYMAN MERRICK.

Remarks by the Editor.

We have seen some of these wrenches, and esteem them as not only the neatest, but the best articles of the kind that have ever been manufactured for sale. There are, we are informed, a considerable number of hands employed in making them; but the demand for them is so great, that they have not yet found their way, in numbers, to any great distance from the manufactory, in Springfield, Massachusetts. We have no doubt, that, in point of strength and durability, they excel, in a triplicate proportion, the imported wrenches of the same size; and they equally exceed them in point of workmanship, whilst they are afforded at but a small advance in price.

Specification of a patent for an improvement in the mode of making Water Proof Boots and Shoes. Granted to EDWIN M. CHAFFEE, *Roxbury, Norfolk county, Massachusetts, May 17th,* 1834.

To all whom it may concern, be it known, that I, Edwin M. Chaffee, of Roxbury, in the county of Norfolk, and commonwealth of Massachusetts, have invented a new and useful improvement in the mode of making water proof boots and shoes, from India rubber leather, or India rubber cloth, by cementing them together at the seams, thereby dispensing with sewing altogether; and that the following is a full and exact description of my said improvement:

In the first place, I take the India rubber leather, or India rubber cloth, and cut out the pattern of the boot or shoe in the usual form, and also the lining, which must likewise be of India rubber leather, or India rubber cloth, so that, when the outside and the lining are put together, the India rubber surface of both outside and lining will come together, and adhere, on being wet with a solution of India rubber in spirits of turpentine, and pressed together with the hands.— The seams which close the quarter and the vamp together, are made in the following manner. The lining of the quarters is cut about one-quarter of an inch longer than the outside, and the lining of the vamp is cut as much shorter, so that the lining of the quarter overlaps the joint or seam of the outside, and the joint or seam of the lining is overlapped by the outside of the vamp. In addition to this, a piece of cloth or leather, three-fourths of an inch wide, and as long as the seam, which I call a stay, is cemented between the outside and the lining, and breaks the joint or seams of both. The quarters are closed together in the same manner when they are cut in two pieces, and a

stiffener is cemented in between the lining and the outside, in both cases.

The inner sole is then fitted to the last in the usual manner, and is then coated with the solution, or cement. The uppers are then put on the last, and the inside of the lining is then coated with the cement around the bottom edge, and as wide as it is to come in contact with the inner sole, when drawn over it, to which it is secured by merely pressing it with the hand. The bottom is again coated with the cement, as far it is required to have the outer sole adhere, and the outer sole is then coated on the inside, and put on, and pressed with the hands, till it adheres firmly. The heel is also cemented on in the same manner; but if a spring heel be wanted, it must be put on before the outer sole.

After the shoe is dry, it is then trimmed off, and bound in the usual manner.

What I claim as my improvement, is, the construction of water proof, or other boots and shoes, upon the principles above described.

Edwin M. Chaffee.

Remarks by the Editor.

On a late visit to Boston, near to which is the manufactory of these shoes, and of other articles rendered water proof by means of India rubber, we had an opportunity of examining them in great variety. They are perfectly neat in their appearance, and we see no reason to doubt their durability; they are not, when on, and scarcely when off, distinguishable from those made in the usual way; and for ladies especially, to whom fashion has assigned a covering for the foot, which affords it but little protection against wet, they are especially desirable. But, although all ought to have them, they are not adapted to general use. Shoes made water proof, in any way, confine the perspiration of the feet, and would soon, even in cool weather, but more especially in summer, produce very unpleasant effects, as has frequently been noticed by those who have persevered in using them.

Mr. Samuel D. Breed, of Philadelphia, has a previous patent for attaching soles to shoes by means of India rubber.

ENGLISH PATENTS.

Specification of the Patent granted to Charles Joseph Hullmandel, *Printer, for a certain Improvement in the art of Block Printing, as applied to Calico and some other fabrics. Sealed Oct.* 28, 1833.

To all to whom these presents shall come, &c.—Now know ye, that in compliance with the said proviso, I, the said Charles Joseph Hullmandel, do hereby declare the nature of my said invention to consist in doing away with many of the difficulties and inaccuracies of that part of the process of blocking printing called "putting on," and lessening the time usually occupied therein, by applying a certain mode of engraving and printing thereto. And in further compliance

with the said proviso, I, the said Charles Joseph Hullmandel, do hereby describe the manner in which my said invention is to be performed by the following statement thereof, (that is to say:)

Having procured an original pattern, as drawn by the artist, I place upon it a sheet of that transparent substance made from isinglass or gelatin, known by artists and sold in Paris by the name of papier glace, and in London by the name of glass paper; I then take a fine sharp tracing point, and make a tracing of the pattern in such manner as to form, in fact, an etching or incised outline on the papier glace; this done, it will be found that the tracing point has raised a slight burr on each side of every line; this must be removed by a sharp scraper lightly passed over the surface of the papier glace: when this is done, the papier glace is to be treated as an engraved copper plate, and having been inked with printer's ink, and cleaned off in the usual way, an impression must be thrown off from it upon thin oiled silk, by means of an ordinary roller press, care being taken that the papier glace should be uppermost, or next to the roller, and the oiled silk undermost, or on the bed of the press. The impression thus obtained on the oiled silk is to be turned down on the block, and transferred to it by slightly rubbing it on the back. The same piece of papier glace will give off a great number of impressions; and thus by having numerous pieces of oiled silk, with one person to attend the press and one to transfer to the block, an often-repeated pattern may be put on, as it is called, in a very few minutes; and the hand of the artist now required to redraw and complete the present blurred impression on the block, by making a perfect outline with a brush and carmine, entirely superseded. It should here be stated, that the papier glace will not bear any application of water to its surface, and that all the inks used for impressions to be taken from it, must therefore be what are termed fatty inks; and as it is necessary, in the process of putting on, sometimes to use different colours for different parts of the outline, as also, on certain occasions, to use colour which will withstand the wetting which the block has sometimes to undergo, I shall now proceed to name several inks suited to that purpose, which, though they form no part of my said invention, will nevertheless enable the manufacturer to make use of my said invention to greater advantage, and in a more extensive way.

Instructions for making the said Inks.

Take some varnish, (burnt linseed oil,) mix with it a little tallow and some sweet oil—lay this by for use.

For Red Ink.—Mix some of the above with as much carmine as it will take; the stiffer the ink is made by adding colouring matter, the sharper the impression will be. Previous to throwing off or transferring the impression to the block, the latter must be well washed with a solution of caustic potash or soda, and allowed to dry; and be it recollected, that with this ink, as well as with all the following, immediately or some time after the impression is taken, a sheet of clean paper must be put over or laid on the block, and a hot iron run over

it to fix the ink; while the wood is still hot, pour over it a solution of alum, and if the yellow tinge produced by the caustic, potash, or soda, still remains, and it is wished to be removed, a weak solution of muriatic acid will effect the purpose. You may, in grinding this ink, add a small portion of dry soap.

For Black Ink.—Take about equal parts of nitrate of silver, commonly called lunar caustic, and varnish; add a little lamp black, merely to colour the ink, and grind the whole well on a glass or marble slab. For this ink the block may or may not be washed with a solution of caustic, potash, or soda. When the block is washed with a solution of wax in turpentine, varnish and lamp black only may be used for throwing off impressions: when this solution is adopted, do not use a hot iron after the transfer is finished, but merely hold the block near to the fire; this will fix the pattern.

For Blue Ink.—Grind equal parts of green sulphate of iron, dried over the fire, and common red ochre, or any colour containing iron. (add a little indigo to give colour to the ink,) with varnish.—Wash the block with prussiate of potash, and caustic soda, or potash. After the impression has been fixed with a hot iron, pour some muriatic acid (diluted) on the whole, (do not use a brush for this operation, or the lines will smear,) to bring out the colour.

For Blue Ink with Indigo.—Grind, very fine, some indigo with varnish, and, if thought proper, some yellow orpiment. Wash the block with a solution of caustic potash.

Now it is evident that my said invention is applicable to all those styles of block printing, where the process called "putting on" is used, and various modes of availing himself of it, in the whole or in part, will occur to the manufacturer, which it would be unnecessary here to enumerate; thus, for instance, when part of the pattern is made from engraved rollers, the remainder may be traced on papier glace; or where the brassed blocks, as they are called, (the putting on of which has been performed as aforesaid) are used, an impression may be taken from them on fine oiled silk, and then such parts of the pattern as are to be transferred to blocks may be outlined by hand on the silk with the aforesaid inks, and the silk then turned over on the block, and an impression given of the pattern on the block, without the ordinary hammering or blows on the back of the block. Another great advantage of this mode of proceeding as regards brassed blocks, is, that though the whole brassed pattern will be given on the oiled silk, only so much as is necessary to guide the cutter will be transferred to the other block, which will cause much less confusion to the cutter. It is only necessary further to add, that the papier glace (if that be the transparent substance used) should be kept in a dry place, and when engraved, if laid by, will serve to renew the pattern, at a very short notice, at any time when required, and when no longer wanted may be melted up and formed into new sheets of papier glace.

Now whereas, I claim as my invention, etching or scratching a copy of the pattern to be used in block printing on a transparent substance, such as the said papier glace, while placed over the original pattern drawn by the artist, and then by means of coloured inks suited to the

transparent substance used for the etching, as also to the wetting of the blocks when cutting; throwing off a print from the etching in an ordinary copper-plate printing press, in the manner aforesaid, upon a thin oiled silk, and transferring the same on to the block while the ink is wet, by turning that side of the silk containing the impression over on the block, and applying slight friction and pressure to the back of the silk, as aforesaid. [*Rep. Pat. Inv.*

Specification of a patent granted to JOHN MILNE, *Architect, for a machine or engine for dressing of stones used in masonry, by the assistance of a steam engine, a wind, a horse, or a water power, whereby a great quantity of manual labour will be saved. Sealed 15th September*, 1829.

A machine for picking and dressing stones by attaching the tool to a falling lever, worked like a tilt hammer, the stone being placed upon a movable carriage below, formed the subject of a patent granted to Alex. Dallas, in April, 1824. The invention of the present patentee is for the same object; but in this instance the tools (for there are many) are attached to the periphery of a rotary drum or barrel, and the block of stone is progressively carried along upon a sliding frame under the rotary drum.

The barrel or drum is proposed to be of from eighteen to thirty-six inches in diameter, and from eighteen to forty-eight inches long. Round the periphery of this drum, the tools, whether pecks, chisels, addices, or droves, are to be placed in several series spirally, that is, winding round the periphery of the drum like a screw, so that the several tools may in succession be brought into operation one after the other, upon different points of the stone.

The stone intended to be dressed is, in its rude form, to be fastened upon the sliding carriage by cramps, and, as the drum goes round, the carriage is intended to move on slowly, so that the points of the tools may strike against and chip off portions of the surface.

When the stone has passed once under the operation of the tools on the rotary drum, it is to be slidden back again upon its carriage; and the frame of the carriage with the stone being then raised a trifling distance by means of segment racks and pinions beneath, the carriage with the stone is again passed under the rotary drum, and the tools, pecking as before, chip off further portions of the irregular surface. This operation is to be repeated, and the position of the stone shifted, until the surfaces are worked down or dressed to the desired figure.

The rotary drum carrying the working tools is proposed to be driven by toothed gear connected with a steam engine or other first mover, and the progressive motion of the carriage on which the stone is supported, may be produced by connecting it with the rotary motion of the drum, or the carriage may be moved independently by hand. If the former contrivance is adopted, it is obvious that any

desired speed may be given to the carriage by changing the wheels of the gear which connect the drum and the carriage together.

It is proposed when bevils are desired to be worked upon the surface of the stone, that the rotary barrel should be shaped accordingly, and the tools adapted both in position and figure to produce such surfaces. In a similar way it is proposed that grooves may be cut in the stones, and that after pecking, the surface may be rendered smooth by the tools called droves.

The patentee does not confine himself to any particular forms, dimensions, or positions of the parts, but claims a rotary drum or barrel, carrying the dressing tools, and a carriage beneath for conducting the rough stone along for the purpose of bringing it under the operation of the rotary drum. [*Jour. of Arts.*

Specification of a patent granted to THOMAS SHAW BRANDRETH, *Barrister at Law, for a new method or methods of applying animal power to machinery. Sealed 9th September,* 1829.

The subject of this patent is one of the varieties of locomotive machinery in which a horse or other animal is placed within the vehicle for the purpose of exerting his muscular strength, by pushing with his feet against a receding floor, connected by gear to the running wheels of the carriage.

Upon this principle the power has usually been obtained by the horse or other animal walking upon an inclined plane, or upon the descending part of the periphery of a rotary drum as a treadmill; in which cases the gravity of the descending weight of the animal, principally, produced the power by which the machinery was to be actuated. In the present instance, however, the muscular exertion alone is brought into operation, the weight of the animal not being made conducive to the production of power.

The present machine, which is denominated a Cycloped, is intended to be the agent for drawing a series of loaded carriages behind it upon a railway. Four running wheels, like those usually employed for railway carriages, are affixed, two to the fore axles, and two to the hinder axles of the cycloped, the axles turning in bearings secured to the under part of the horizontal frame of the carriage. Two cylindrical barrels are also mounted upon axles supported by the frame, round which barrels an endless band, or two parallel endless chains, are passed. To this endless band or chains a series of transverse battens or rails of wood, placed close together, are attached, which being supported by a series of small rollers, mounted transversely in the side frames of the carriage, form a horizontal platform for the horse or other animal to stand or walk upon.

The axles of the running wheels, and those of the cylindrical barrels, are connected together by toothed wheels and pinions, so that any rotary motion being given to the barrels will be communicated to the running wheels, and cause them to carry the cycloped forward.

On the top of the horizontal framework of the carriage, upright posts and side rails are erected, forming a sort of stall to enclose the horse, with a trough or manger in front, that the animal may feed as it goes on. A collar is placed round the horse's neck, with traces or chains attached to the harness, which traces are hooked to staples in the side rails.

The horse being now made to pull by his collar, the traces draw from the staples in the side rails, and in making this effort to advance, the horse's feet act as levers against the rails of the movable floor or platform, which being by these means slidden back, causes that rotary movement of the drums connected to the platform, and of the toothed pinions upon their axles, which turns the axles of the running wheels, and impels the carriage forward upon the railway, drawing the train behind it. [*Ibid.*

ON THE MANUFACTURE OF VARNISHES.

(Continued from p. 281.)

Exp. V.—*That moist Driers boiled in Varnish cause it to run in Pin-holes.*

To eight gallons of very fine African copal, during the boiling, I introduced half a pound of undried copperas and half a pound of undried sugar of lead. After the varnish had stood to settle for eight months, I varnished with it a pale patent yellow pannel; it floated very well, set and looked well for four hours, when it began to dry off in small pin-holes completely over the surface, some of the holes as large as the head of a pin. It dried off in seven hours without any tack.

Exp. VI.—*That the greater the Quantity of Driers and Acid, the larger the Pin-holes.*

I emptied six gallons out of the jar containing the last-named varnishes, then I varnished another pannel out of the two gallons remaining in the jar: the pannels dried in the same time, but went off not only into pin-holes, but into large blotches all over.

Exp. VII.—*That Particles either of Oil or cold Turpentine in the Varnish will create Pin-holes and Blemishes.*

To one gallon of body varnish, nine months old, which had been tried and found to be excellent, I introduced a quarter of an ounce of water and a quarter of an ounce of linseed oil. I heated and mixed all together, and poured it into a jar, and let it stand for three months, when I varnished two pannels, one yellow and the other light green; four hours after, when I examined them, they were about half dry, and beginning to run into pin-holes and round empty holes. I examined them with a microscope, and found a particle of oil hanging to the lower edge of every circle, and the small particles of water

had evaporated; the surface appeared as if dotted with the points of as many bristles. I repeated this experiment several times, but always with the same results.

Exp. VIII.—*That Copperas does not combine with Varnish, but only hardens it.*

Three pounds of very fine African copal, one gallon of clarified oil, and two ounces of dried copperas, were mixed off with two gallons of turpentine, which, after being strained, had been put by in an open mouthed jar for eight months; I then poured off all the varnish, not quite to the bottoms. I afterwards well washed the sediment left at the bottom of the jar with two quarts of warm turpentine, which I filtered through some very fine cambric muslin, and afterwards dried the copperas in the sun; it still weighed two ounces, and appeared like what it nearly was, powder of zinc.

Exp. IX.—*That Sugar of Lead does combine with Varnish.*

With the same quantity and quality of gum, oil and turpentine, I made three gallons of copal varnish, introducing two ounces of dried sugar of lead during the boiling. I put it in a jar for eight months. I then poured off all the varnish, and washed out the sediment with half a gallon of warm turpentine, filtered as before. I dried the residuum left on the muslin, which only weighed seven drachms, and appeared of a pearly lead colour, so that the varnish had absorbed the remainder. This varnish was very good, and dried well.

Exp. X.—*That Turpentine improves by Age.*

Three pounds of fine African gum-copal, with one gallon of clarified oil, were boiled without any driers, and thinned with two gallons of turpentine which had been kept in an open leaden cistern for upwards of two years, until it had become thickened and appeared like oil. After being mixed off and strained and set to settle only two days, I tried it on several pannels of different colours, when it dried hard, firm, and brilliant, without any tack, in less than eight hours. I kept the remainder of this varnish for twelve months, when it became too thick to use. I poured it into the gum-pot, brought it near to a boiling heat, and poured to it half a gallon of the same old turpentine, and set it aside for two days, when I varnished three fresh pannels of three different colours, which had been previously twice varnished; they all dried firm and free from tack in less than five hours, and had every appearance of fine cabinet varnish. These three pannels were afterwards laid on the roof of a shed for twelve months, and, when polished, looked solid and brilliant, and the colours were less changed than any I ever saw in the same time.

Exp. XI.—*That Varnish improves by Heat.*

Very recently I had a brick erection (two feet high by four feet wide) built all round the warehouse, with an air-furnace at one end, where-

by the heat and smoke were conveyed inside a large flue in the brick work from one end to the other, where it joined into a chimney-shaft. This brick erection was covered with foot-tiles laid in composition, and over the foot-tiles was laid a bed one inch thick of fine sand sifted. Upon this sand were set the varnish cisterns, four feet by three, and three feet deep, made of inch and quarter boards, and lined with lead. When these cisterns were filled up, each held 150 gallons, and a regular fire was kept up in the furnace every other day. During the time the fire was kept up, the varnish in the cisterns expanded to such a degree, that it rose two inches in the cistern nearest the furnace. During the time of its expansion it gave out a sickly smell of gas, turpentine, and moist air; but as soon as the furnace begins to cool gradually, the acid, moisture, and driers, descend to the bottoms of the cisterns, while the varnish on the surface attracts fresh oxygen from the air of the warehouse; so that, by alternately heating and cooling the varnish in this manner for four months, it acquired all the properties and qualities equal to varnish which has been kept without heat for twelve months. I have repeatedly tried the experiment, and always found it answer.

Exp. XII.—*That all Copal or Oil Varnishes require age before they ought to be used.*

I have frequently filled up several cisterns of varnish, each containing 150 gallons. When they have stood one month, I have varnished a pannel with varnish from the surface of each, when I have found every one of the pannels dry firm in regular time, and have no appearance of pin-holes whatever. On the same day I have taken out fifty gallons of varnish from each cistern. I then, out of the cisterns, which had 100 gallons left in each, varnished a pannel. I found all these dry in the same time as the first, but every pannel was either more or less sleepy or steamy, and appeared as if a fine mist had carried off the glossiness.

After taking out forty gallons more from each cistern, there were only sixty gallons left in each. I then varnished a pannel from each cistern; none of them dried so soon by two hours, and every pannel was opaque and full of pin-holes. I repeated the same experiment from different cisterns of varnish many times, at various periods from the varnishes being made, from one month's age to twelve, and have invariably found that the varnish within fifteen inches of the surface is more perfect and sooner ready for use than that beneath it, and that the varnish towards the bottom of all cisterns requires time and the action of warm air to cause the moisture, acid, and driers, to settle before the varnish is fit to use.

Concluding Observations.

N. B. All body varnishes are intended and ought to have $1\frac{1}{2}$ lbs. of gum to each gallon of varnish, when the varnish is strained off and cold; but as the thinning up, or quantity of turpentine required to bring it to its proper consistence, depends very much upon the degree of

boiling it has undergone, therefore, when the gum and oil have not been strongly boiled, it requires less turpentine to thin it up; whereas, when the gum and oil are very strongly boiled together, a pot of twenty gallons will require perhaps three gallons above the regular proportionate quantity; and if mixing the turpentine is commenced too soon, and the pot not sufficiently cool, there will be frequently above a gallon and a half of turpentine lost by evaporation.

All carriage, wainscot, mahogany, &c. varnish ought to have full one pound of gum for each gallon, when strained and cold; and should one pot require more than its proportion of turpentine, the following pot can easily be left not quite so strong boiled, then it will require less turpentine to thin it up.

Gold sizes, whether pale or dark, ought to have full half a pound of good gum to each gallon when it is finished; and best black japan to have half a pound of good gum, or upwards, besides the quantity of asphaltum. The foregoing proportions I have found to answer best in general; but, recollect, if the gum either be of such inferior quality that it will not properly fuse, or if it should, through inexperience or neglect, not be properly fused, however good the quality, the produce will be both inferior and deficient. And I am perfectly convinced, from forty years' experience, that the greatest and most essential art belonging to the business of varnish-making consists in the management and regulation of the fire in the gum-furnace, so that the gum, from the beginning of its softening in the gum-pot, and during the whole time of its fusion, shall be so managed, according to the nature and quality of that particular sort, particularly in increasing the heat, that it shall carry up and out of the pot all, or as much of, the gas and acid as is possible, which is the most difficult for an inexperienced person to understand, and, indeed, very few think about it.

Every varnish maker, during the time his furnaces are at work, ought always to have his assistant at hand, whether he is wanted or not; and when any thing is to be done quickly, such as lifting a pot from the fire, pouring, or any thing that requires two persons, never do any thing in a hurry or flutter, but always be cool, collected, and firm; and to insure against accidents, be prepared to meet them deliberately. A nervous or timorous person is unfit either for a maker or assistant, and the greatest number of accidents occur either through hurry, fear, or drunkenness.

Fine Mastic or Picture Varnish.

Put 5 lbs. of fine picked gum-mastic into a new four-gallon tin bottle; get ready 2 lbs. of glass bruised as small as barley; wash it several times; afterwards dry it perfectly, and put it into the bottle with two gallons of turpentine that has settled some time; put a piece of soft leather under the bung, lay the tin on a sack upon the counter, table, or any thing that stands solid; begin to agitate the tin, smartly rolling it backward and forward, causing the gum, glass, and turpentine, to work like a barrel-churn for at least four hours, when the varnish may be emptied out into any thing sufficiently clean, and large enough

to hold it. If the gum is not all dissolved, return the whole into the bottle and agitate as before, until all the gum is dissolved; then strain it through fine thin muslin into a clean tin bottle; leave it uncorked, so that the air can get in, but no dust; let it stand for nine months at least before it is used, for the longer it is kept the tougher it will be, and less liable to chill or bloom. To prevent mastic varnish from chilling, boil a quart of river-sand with two ounces of pearl-ashes, afterwards wash the sand three or four times with hot water, straining it each time; put the sand on a soup-plate to dry in an oven, and when it is of a good heat, pour half a pint of hot sand into each gallon of varnish, and shake it well for five minutes; it will soon settle and carry down the moisture of the gum and turpentine, which is the general cause of mastic varnish chilling on paintings.

Common Mastic Varnish.

Put as much gum mastic, unpicked, into the gum-pot as may be required, and to every 2¾ lbs. of gum pour in one gallon of cold turpentine; set the pot over a very moderate fire, and stir it with the stirrer; be careful, when the steam of the turpentine rises near the mouth of the pot, to cover it with the carpet, and carry it out of doors, as the least steam will catch fire: a few minutes low heat will perfectly dissolve 8 lbs. of gum, which will, with four gallons of turpentine, produce, when strained, four and a half gallons of varnish, to which add, while yet hot, five pints of pale turpentine varnish, which improves the body and hardness of the mastic varnish.

Another Cheap Varnish for Paper-hangings.

Put into the gum-pot 10 lbs. of gum cat's-eye, with four gallons of turpentine, and at a low heat dissolve it like the mastic; then strain it into the cistern or tin. After having washed out the gum-pot, and wiped it clean, dissolve 5 lbs. of unpicked gum mastic in two gallons of turpentine, and strain it warm into the cat's-eye varnish. After washing and wiping out the gum-pot as before, dissolve 10 lbs. of good white frankincense with four gallons of turpentine, strain it, and, while hot, add this to the two former products; stir them together, take a little out in a saucer, and if too thick, thin it with turpentine until of a proper consistence: when boiled, it may be used, but it is better for age. This may be made excellent at the cost of 10*s*. per gallon.

Crystal Varnish

May be made either in the varnish house, drawing room, or parlour. Procure a bottle of Canada balsam, which can be had at any druggist's; draw out the cork, and set the bottle of balsam at a little distance from the fire, turning it round several times until the heat has thinned it; then have something that will hold as much as double the quantity of balsam, carry the balsam from the fire, and, while fluid, mix it with the same quantity of good turpentine, and shake them together until they are well incorporated: in a few days the varnish is fit for use, particularly if it is poured into a half-gallon glass or stone

bottle, and kept in a gentle warmth. This varnish is used for maps, prints, charts, drawings, paper ornaments, &c., and when required to be made upon a larger scale, requires only warming the balsam to mix with the turpentine.

White hard Spirit of Wine Varnish.

Put 5 lbs. of gum sandarach into a four gallon tin bottle, with two gallons of spirits of wine, 60 over proof, and agitate it until dissolved, exactly as directed for the best mastic varnish, recollecting, if washed glass is used, that it is convenient to dip the bottle containing the gum and spirits into a copper full of hot water every ten minutes, the bottle to be immersed only two minutes at a time; it will greatly assist the dissolving of the gum; but, above all, be careful to keep a firm hold over the cork of the bottle, otherwise the rarefaction will drive the cork out with the force of a shot, and perhaps set fire to the place. The bottle, every time it is heated, ought to be carried away from the fire, then ease the cork a little, to allow the rarefied air to escape; then drive it tight, and continue the agitation in this manner until all the gum is properly dissolved, which is easily known by having an empty tin can to pour the varnish into, until near the last, which pour into a gallon measure; and if the gum is not all dissolved, return the whole into the four-gallon tin, and continue the agitation until it is ready to be strained, when every thing ought to be quite ready, and perfectly clean and dry, as oily tins, funnels, strainers, or any thing damp, or even cold weather, will chill and spoil the varnish. After it is strained off, put into the varnish one quart of very pale turpentine varnish, and shake and mix the two well together. Keep spirit varnishes well corked; they are fit to use the day after being made.

Brown hard Spirit Varnish

Is made by putting into a bottle 3 lbs. of gum sandarach, with 2 lbs. of shell-lac, and two gallons of spirits of wine, 60 over proof; proceed exactly as before directed for the white hard varnish, or by agitating it when cold, which requires about four hours' time, without any danger of fire; whereas making any spirit varnish by heat is always attended with danger. No spirit varnish ought to be made either near a fire or by candle-light. When the brown hard is strained, add one quart of turpentine varnish, and shake and mix it well; next day it is fit for use.

Gold Lacker.

Put into a clean four-gallon tin, 1 lb. of ground turmeric, $1\frac{1}{2}$ ounce of powdered gamboge, $3\frac{1}{2}$ lbs. powdered gum sandarach, $\frac{3}{4}$ lb. of shell-lac, and two gallons of spirits of wine. After being agitated, dissolved, and strained, add one pint of turpentine varnish, well mixed.

Red Spirit Lacker.

2 gallons of spirits of wine,
1 lb. of dragon's blood,

3 lbs. of Spanish annato,
$3\frac{1}{4}$ lbs. gum sandarach,
2 pints of turpentine.

Made exactly as the yellow gold lacker.

Pale Brass Lacker.

2 gallons of spirits of wine,
3 ounces of Cape aloes, cut small,
1 lb. of fine pale shell-lac,
1 ounce gamboge, cut small,
No turpentine varnish.

Made exactly as before; but observe, that those who make lackers frequently want some pale and some darker, and sometimes inclining more to the particular tints of some of the component ingredients. Therefore, if a four ounce vial of a strong solution of each ingredient be prepared, there can be at any time produced a lacker of any tint required.

Having so far given plain and particular directions, it will be very easy for the operator to modify, or make any intermediate proportion or alteration, according to his judgment or inclination.

¶ *Steamboats on the Western Waters.*

In a publication made by the writer of this article in 1829, on the interesting subject of steamboats, it was calculated that from the time of their first introduction on the western waters in 1811, until that period, their number amounted to about three hundred and twenty-three. Their united tonnage was estimated at fifty-six thousand tons. From the best data which could be procured from the most intelligent sources, the original cost of these boats was five millions six hundred thousand dollars, and the repairs on the same number, assuming that none of them would last longer than 1832, was set down at two millions eight hundred thousand dollars. Now, although there were five or six boats built between the years 1811 and 1817, the latter period may be assumed as the epoch of their regular and successful introduction; in 1825 they were brought to their present state of perfection. It results, then, that the amount expended for the building and repairing of steamboats, in a period of about eleven years, was equal to eight millions four hundred thousand dollars. As the number of steamboats was increasing yearly, no fixed amount can easily be assumed for the yearly expenses, but for the year 1829, the sum was fixed at two millions five hundred thousand dollars; if, then, five hundred thousand dollars be considered as a fair yearly average from 1818, the total amount of money expended on the shores of the western waters, up to 1829, inclusive, will be little short of fourteen millions of dollars. When it is considered that this circulation and expenditure of money was exclusively created by the introduction of the steamboat, the importance of this invention to the

Valley of the Mississippi, may be conceived. It has produced an advance of prosperity that would have required more than a century to have realized in the ordinary progress of human affairs; it has produced a revolution in business little inferior in importance to that which followed the discovery of the art of printing.

On the first of January, 1834, an official list of steamboats, from an authentic source, gives the whole number of two hundred and thirty, whose aggregate amount of tonnage is equal to about thirty-nine thousand tons. Allowing the cost of building at a rate much lower than the rule adopted three years since, the capital now invested in this stock will exceed three millions of dollars. The expense of running may be put down nearly as contained in the following scale:—

60 boats over 200 tons, 180 running days, at $140 per day, . . .	$1,512,000 00
70 boats from 120 tons to 200, 240 running days, $90 per day, . . .	1,512,000 00
100 boats under 120 tons, 270 running days, $60 per day, . . .	1,620,000 00
Total yearly expense,	4,644,000 00

This sum may be reduced to the different items producing it in the following proportions, viz:

For wages, 36 per cent., equal to .	$1,671,840 00
" wood, 30 per cent., equal to .	1,393,200 00
" provisions, 18 per cent., equal to .	835,920 00
" contingencies, 16 per cent., equal to .	743,040 00

This result is truly striking to those who were accustomed to the state of things on our rivers within twenty years. The difference in the amount of wages paid, is in itself very considerable; but the item of fuel is one created exclusively by steamboats; and when it is considered that nearly one million and a half is expended every year, at a few points on the Mississippi Valley, it presents a vast field for speculation. The immense forests of beech and other timber unfit for agricultural purposes, were, before, not only useless, but an obstacle to the rugged farmer, who had to remove them before he could sow and reap. The steamboat, with something like magical influence, has converted them into objects of rapidly increasing value. He no longer looks with despondence on the denseness of the trees, and only regrets that so many have already been given to the flames, or cast on the bosom of the stream before him.

At the present period, the steamboats may be considered as plying as follows, viz:

25 over 200 tons, between Louisville, New Orleans, and Cincinnati, measuring . . .	8484 tons.
7 between Nashville and New Orleans, measuring	2585 "
4 between Florence and New Orleans, .	1617 "
4 in the St. Louis trade, . . .	1002 "
7 in the cotton trade, . . .	2116 "

57 boats not in established trades, from 120 to 200 tons,	8641 tons.
The balance under 120 tons in various trades,	14655 "
	39,000

In the New Orleans and Louisville trade, the boats over two hundred tons make about one hundred and forty trips, in prosperous seasons; those of smaller size, make from fifty to sixty trips But to go into an estimate of the number of voyages made by the boats in the different trades, is impossible, because no regular data are furnished, and the result depends upon a variety of contingencies.

Previous to the introduction of the steamboat in 1817, about twenty barges, averaging one hundred tons, afforded the only facilities for transporting merchandise from New Orleans to Louisville and Cincinnati. These making but one trip within the year, gave the means of bringing up only two thousand tons. The present tonnage in this trade exclusively, having been stated to be 8484 tons, gives the amount employed, amounting to one hundred and forty trips in the season, to be 1,187,760 tons; a cause capable of producing a revolution in sixteen years hardly equalled in the annals of history. The effects of these causes upon western commerce have necessarily been immense. The moral changes alone are felt throughout the west, and the effect on prices is almost incalculable: the imported article has fallen in a ratio equal to the increased price of western products. In looking back to the old means of transportation, we cannot conceive how the present demand and consumption could have been supplied by them.

To those who are acquainted with the early mercantile history of our country, when it was no uncommon thing for a party of merchants to be detained in Pittsburgh from six weeks to two months by low water and ice, the existing state of things is truly gratifying. The old price of carriage of goods from the Atlantic seaboard to Pittsburgh, was long estimated at from five to eight dollars for one hundred pounds. We have instances in the last five years, of merchandise being delivered at the wharf of Cincinnati, from Philadelphia by the way of New Orleans, for one dollar per hundred.

It may not be useless, or uninteresting, to give an idea of the *mortality* among steamboats in a given time. It is not pretended that any decided inference can be drawn from this statement, or that the facts go to establish any fixed rule. But under the present situation of steam-boat discipline and regulations, a tolerably fair conclusion can be drawn from it. Taking the period, then, of two years from the fall of 1831 till that of 1833, we have a list of boats gone out of service of sixty-six: of these, fifteen were abandoned as unfit for service; seven were lost by ice; fifteen were burnt; twenty-four snagged, and five destroyed by being struck by other boats. Deducting the fifteen boats abandoned as unseaworthy, we have fifty-one lost by accidents peculiar to the trade. In number, this proportion is over twelve per cent. per annum: in tonnage, the loss is upwards of ten per cent. Amount snagged, 3721 tons; amount burned, 2330 tons.

The foregoing calculations and statements afford great field for

speculation. It is evident that there is a vast amount of surplus tonnage, and, of course, the business at present is entirely overdone. Indeed, from a full investigation of the subject, a few years since, by a committee appointed for the purpose, it was fully ascertained that, although the benefits conferred on the Valley of the Mississippi were incalculable, the stock invested in boats was, as a general rule, a losing investment; in many cases, a total sacrifice. In a few cases, owing to a fortuitous combination of circumstances, money has been made; but the instances are so few as not to affect the rule. Time may correct this evil; but in a business in which public interest and public safety are so much concerned, a little governmental interference and assistance might be useful, and ought to be tendered. Some legislative action, which might tend to arrest the fearful increase of accident, has long been a desideratum; but how this is to be applied, presents the great difficulty. An experiment, however, has been tried, which seems to hold out the prospect of success. We allude to the company which was formed in 1832-3, called the Ohio and Mississippi line of transportion. During the existence of this company, not an accident of any kind occurred to person or property. A perfect regularity in arrivals and departures was introduced, and as all the good boats were in the same interest, there was no foolish rivalship, and consequently no injudicious racing. How far the post-office department would be justifiable in aiding such an association, we do not pretend to say; but in our humble view of the case, we consider the great interests of the west are much involved in the question; and when the great uncertainty and irregularities of the mail, which have hitherto distinguished the routes between New Orleans, Natchez and St. Louis, and Pittsburg, Louisville and Cincinnati, are considered, something is expected. On the score of economy alone, the subject is worthy of the reflection of the general government. Probably nine-tenths of the correspondence on the western waters is of a commercial character; the greatest portion of this is now transmitted, free of postage, by the means of passengers: no one can prevent this. If a line of steamboats can be made interested in protecting the government, the general post-office would find it to its advantage to give liberal terms to such an establishment. N.

[*West. Mag.*

¶*Manufacturing Establishments at Cincinnati*, (*Ohio*) *in* 1834.

There are more "manufacturing establishments" in this city than in any city or town in the west. Pittsburgh ranks next to us in that respect, and perhaps is ahead of us, when we take into consideration the difference of population. Cincinnati has a third more inhabitants than Pittsburgh. We have twelve or thirteen foundries and engine factories, for the manufacturing of engines for steamboats, flour mills, grist mills, rolling mills, and for blast furnaces, used in this section of country, and for sugar mills, corn mills, cotton gins, saw mills, and other uses, for the south, where an immense amount is exported

yearly. An estimate was made in 1832, for the year previous, of the amount exported of articles of the above description, and it exceeded $400,000.

We have also a large and extensive rolling mill, owned and conducted by Messrs. Shreve, Paull and M'Candless, gentlemen of great enterprise, who employ about one hundred men. They cut some ten to eleven tons of nails per week, and roll sixty to seventy tons of iron per week—an extensive and complete spade and shovel factory—seven or eight bell and brass foundries, where an almost unlimited amount of work is done—twelve steam saw mills, all of which are conducted on a very large scale; at most of them there are machines connected for cutting laths, shingles, &c.—5 to 7000 laths can be cut in an hour. At some of these mills they have a saw for cutting boards and timber, a circular saw, and a machine for planing flooring boards, all driven by steam power.

Two flour mills, one owned by C. Bradbury, Esq., and driven by water from the canal—they make sixty or seventy barrels every twenty-four hours. Connected with this establishment, is an oil mill, for the manufacturing of linseed and castor oils; there is also a mill connected for grinding and sifting corn meal, large quantities of which are barrelled and exported. Our largest and most extensive flour mills in this section of the state are on the big and little Miami rivers, which empty into the Ohio, above and below this city, and are situated from ten to fifty miles from Cincinnati; they manufacture, some 100, some 150, and some 200 barrels, every twenty-four hours. All this flour is sent to this market by canal and wagons, and then exported to New Orleans, the Atlantic cities, &c. The other flour mill in the city is worked by steam, and can manufacture, when in operation, 150 barrels per twenty-four hours. I would stop here to remark, that there are about sixty steam engines in constant operation within the corporation lines, exclusive of those on our steamboats, and *all* high pressure; low pressure engines are not in good repute in the west.

A card manufactory, owned by M. P. Cassilly, Esq., where every description of machine cards are made. A large number of establishments for the manufacture of steam boilers, where hundreds of men are constantly employed. A stereotype foundry, and also a large and extensive type foundry, owned by N. Guilford, Esq., and others, where is manufactured every variety of type, printing presses, and every article connected with the printing business; there are eleven or twelve machines for cutting type, and sixty to seventy hands are constantly employed; they manufacture to the amount of some 50 to 60,000 dollars per year.

A steam fire engine factory, owned and conducted by Messrs. Chase and Seymour. The engines manufactured by them are equal for power, beauty, and workmanship, to any manufactured east of the mountains.

A patent lever lock factory, by Messrs. Shawk and Fitz.

A steel saw and file factory, by Messrs. Garrard & Co.

A printing press manufactory, on an extensive scale, by S. Dickinson.

A saddle tree manufactory, machinery driven by steam, conducted by Messrs. Kendall & Co.

A clock factory, by Lerman Watson, Esq., where is manufactured clocks, both of brass and wood. The establishment is a large one; many hands are employed, and many clocks made, of every description.

A factory for rolling sheet lead, and drawing lead pipes, by steam, for hydraulic purposes.

A Steam, Stone Saw Mill.—This establishment is worked on a new principle, and is patented to the proprietor, (Mr. Jas. Henderson.) It cuts stone with great accuracy.

A white lead manufactory, by steam power, owned by James M'Candless, Esq.

A bark, and leather rolling, mill, owned by the Messrs. Clarks, and worked by steam. The manufacture of malt liquors is carried on very extensively in the city, and to great perfection. There are eight very large breweries, and the beer, porter, and ale, manufactured by them, is equal to any I have ever seen in the eastern cities. We have a great number of snuff and tobacco manufactories, last factories, candle and soap factories, &c. Hats, furniture, etc., are manufactured in great quantities, and exported for sale to Kentucky, Tennessee, Mississippi, Louisiana, and every state south and west of us.

My limited information on the subject of manufactories, as well as want of time, will prevent me from giving you a more minute account of the manufacturing and mechanical business, carried on to a very great extent, and to equally great perfection, in Cincinnati. I have named a few, and only a few, of the largest establishments, those that have come to my mind while writing; there are many others, where great numbers of hands are employed, that I do not at this moment think of. Opposite the city, at Newport, is a large cotton bagging factory. It is on a very extensive scale, owned by an incorporated company, with a capital of half a million. They manufacture bagging, bale rope, twine and cordage, Kentucky jeans, cotton and woollen coarse goods, sheet lead and pipe—all of which is carried on by steam power. The machinery, when in full operation, will use annually 450 tons of hemp, 850 bales of cotton, 95 tons of wool, and 200 tons of lead. The agent resides, and transacts all the business of this establishment, in Cincinnati. There is also in Newport, a steam saw mill.

In Covington, also opposite to this city, is a large cotton factory, owned by C. Macalister & Co., of this city; they run 2500 spindles, and manufacture 300,000 lbs. cotton yarn per annum. Sixty hands are employed. The yarn is sold here. There is also in Covington, a rolling mill, on a large scale, a rope walk, steam flour mill, and a steam saw mill. [*Patriot.*

¶ *On Silk.*

Mr. Editor,—As the culture of silk is becoming of considerable importance in our country, it may not be altogether uninteresting to

some of your readers to present them a few remarks concerning its early history.

Previous to the sixth century, the art of rearing silk worms was unknown in Europe. Some small quantity of silk stuffs had been brought to the Italian states, from Asia, but only persons of the first rank were able to procure them. Some idea may be formed of their scarcity, and the great estimation in which they were held, from the fact that, in ancient Rome, under Aurelius, A. D. 270, a pound of silk was considered equal in value to a pound of gold.

In the sixth century, Justinian introduced the art of rearing silk worms into Greece, which rendered the commodity somewhat more plentiful; yet the supply was greatly inadequate to the demand, and it continued an article of luxury and magnificence, reserved for persons only of the first order, or for public solemnities.

This is the first of its culture in Europe, and it was not until the beginning of the twelfth century that it was carried into the neighbouring countries—a proof of the averse disposition of mankind to depart from the "beaten track of life." In the year 1130, Roger I., king of Sicily, carried off a number of artificers in the silk trade, from Athens, and, settling them in Palermo, introduced the culture of silk into his kingdom, from which it was communicated to other parts of Italy. From this period, silk increased in plentifulness throughout Europe, and, in the sixteenth century, silk worms were introduced into this country. Thus, an article which was originally confined to the half civilized countries of Asia, has at length become diffused over Europe and America, promoting the comfort and prosperity of the people. [*Southern Planter.* B.

CELESTIAL PHENOMENA, FOR DECEMBER, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.					
8	5	5	Im.	33 *s* Piscium,	,5,	N148°	V119°
8	6	28	Em.			284°	276°
10	13	5	Im.	106 *ν* Piscium,	,6,	69°	118°
10	13	53	Em.			341°	32°
11	12	20	Im.	24 *ξ'* Arietis,	,6,	188°	234°
11	12	44	Em.			224°	274°
11	13	32	Im.	(85) Arietis,	,6,	113°	164°
11	14	31	Em.			287°	338°
18	17	29	Im.	*γ* Cancri,	,5,	0°	54°
18	17	54	Em.			318°	13°
19	9	35	N. App. ☽ and — Leonis, 7, ☽ S. 0',3 or cont't.				
20	10	46	" " ☽ and 42 Leonis, 6, ☽ N. 2', 2				
20	16	48	Im.	42 *i* Leonis,	,6,	46°	53°
20	18	04	Em.			252°	279°
24	13	46	Contact ☽ and 238 Virginis, 7, or short occult'n.				

New Invention.—The proverb realized, "The Cart before the Horse."

Heidelburg, Aug. 15.

In the month of May last, there was seen in the streets of Manheim, a horse pushing before him a carriage, guided with much address by Baron Drais, the author of this invention, which is attended with great advantages:—1. The horse cannot run away. 2. The carriage is not exposed to the dust and dirt generally thrown up by the horse. 3. The prospect is not interrupted by the coachman and the horses. 4. The conversation of the travellers cannot be overheard by the coachman. 5. The travellers are not incommoded by the fumes of the tobacco, &c. The coach-box will be placed on the roof of the carriage, behind, and, by means of a looking-glass, the driver is able to guide the vehicle. This invention is applicable to carriages drawn by four horses.

Meteorological Observations for September, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	62°	63°	29.93	29.90	NE.	Moderate.	0.95	Rain.
	2	64	69	30.00	30.00	E.	do.	0.10	Drizzle.
⊗	3	65	75	.15	.15	SE.	Calm.		Cloudy day.
	4	70	80	.05	.00	W.	Moderate.	0.25	Cloudy—fog—rain in night.
	5	74	73	29.80	.65	S. NE.	do.	0.25	Rain.
	6	70	80	.70	29.75	W.	do.		Clear day.
	7	69	82	.85	.85	SE.	Calm.		Cloudy—thunder shower.
	8	63	70	.95	.90	NE.	do.	1.25	Drizzle—showers.
	9	73	76	.70	.70	SW.	Moderate.	0.07	Cloudy—showers.
☾	10	60	68	.65	.65	W.	Brisk.		Cloudy—lightly cloudy.
	11	52	62	.80	.90	W.	do.		Clear day.
	12	46	62	30.20	30.20	W.	do.		Clear—lightly cloudy.
	13	51	66	.31	.35	SW.	Moderate.		Cloudy—clear.
	14	51	68	.31	.31	S.	do.		Clear day.
	15	54	69	.30	.20	W.	do.		Clear day.
	16	50	71	.14	.31	SW.	do.		Clear day.
☺	17	53	69	29.90	29.90	E.	do.	0.25	Cloudy—rain.
	18	68	70	.80	.75	SE.	do.		Cloudy day.
	19	68	72	.83	.85	SE. SW.	do.	0.10	Rain—clear.
	20	57	72	.85	.90	W.	do.		Clear day.
	21	58	73	.85	.80	NE.	do.		Clear—lightly cloudy.
	22	56	70	.80	.90	NE.	do.		Clear day.
	23	72	75	.80	.75	S.	do.		Cloudy—drizzle—flying clouds.
	24	58	64	.90	.95	NE.	do.		Cloudy day.
☽	25	56	70	30 00	30.00	W.	do.		Cloudy—clear.
	26	54	71	.14	.14	SE.	do.		Lightly cloudy.
	27	60	70	.00	29.90	SE. SW.	do.		Drizzle—clear.
	28	58	54	29.90	.95	NE.	do.	0.15	Cloudy—rain.
	29	44	55	.95	30.10	NW.	Blustering		Clear day.
	30	38	62	30.34	.34	SW.	Moderate.		White frost—clear.
	Mean	59.03	69.07	29.96	30.00			3.37	

	Thermometer.	Barometer.
Maximum height during the month,	82. on 7th,	30.65 on 5th.
Minimum do.	38. on 30th.	29.65 on 10th.
Mean do.	64.05	29.98

JOURNAL

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State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

DECEMBER, 1834.

A Sketch of the origin, progress, and improvement, of Steam Navigation, in the Port of London, from 1814 *to* 1824.

(Continued from p. 90.)

The spring of 1817 was marked by the most disastrous steam packet accident in England. Messrs. Aggs & Curr, whom we have noticed before, (see Defiance,) had built a second vessel, called the Courier, to run on the Warrsum river, between Norwich and North Yarmouth; this vessel was fitted on the high pressure principle, the engine and boilers arranged, in other respects, nearly the same as those of the Defiance. On the 4th of April, this vessel was just about starting, when she blew up, and unfortunately killed several people, among them the engine man, besides maiming and scalding several others. A survivor stated to Mr. Aggs, that the engine man had just previously boasted, "*that he would get his steam well up, and give her a grand start.*" The vessel was almost entirely destroyed; the cylinder boilers had separated in the middles, and the ends flew in opposite directions. The loss of life and property on this occasion, caused a deep sensation throughout the country; the House of Commons instituted an inquiry into it, and some scientific engineers—among them Mr. Brunet, Mr. John Martineau, of the firm of Taylor and Martineau, and we believe Mr. Joshua Field, of Mr. Maudslay's establishment—held a sort of court of inquiry, and were subsequently examined before a committee of the House of Commons, together

with several others, whose knowledge, testimony, or opinions, might be supposed capable of assisting the object of the inquiry. The result was, that the committee reported a bill prohibiting the use of high pressure steam engines, in vessels, and directing a severe test of the strength of boilers, used for such purposes.

During the year 1817, several other steam vessels had been introduced into the port of London, but none of sufficient importance to claim a place, in an abstract, intended to show by whom such improvements were made, as have a material bearing on the present state of steam navigation.

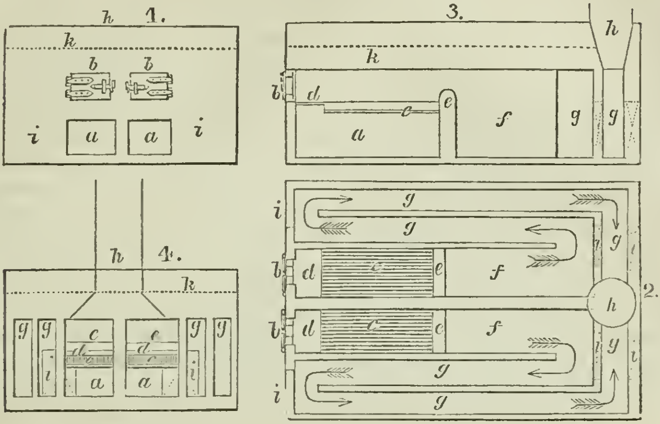
From general principles, confirmed by experience, it was manifest that the quantity of steam generated, did not depend on the size of the boiler, or the quantity of water or steam chambers it contained, but entirely on the surface the fire had to act upon, within the flues surrounded by water, before its exit by the chimney. In many of the early steamers, this principle was lost sight of, and the products of combustion were permitted to escape so directly, that some of those in the Thames were threatened with indictments as nuisances, on account of the coal, sparks, and cinders, ejected from their chimnies, among the thickly congregated vessels near the city of London.

This fault did not exist in the Regent; the length of internal flue, passing through the water, and the construction of the furnaces, preventing it: the cinders or sparks had to travel so far, before they reached the vertical chimney, that they fell, by their own gravity, to the bottom of the flue, or pit, behind the furnace. The width given to the dead plate, just within the doors of the furnace, likewise caused the coal to be partly coaked, before it was finally burnt, and the gas thereby extricated being carried over the ignited fuel, accompanied by a small current of air, admitted between the two parts of the double furnace doors, was consequently immediately ignited, and passing through the flues in a long narrow sheet of flame, thus added to the internal heat, decreasing the smoke, and saving the fuel.

So effective was this mode in practice, that the Regent would frequently run from eighteen to twenty minutes, with only a thin white vapor issuing from the chimney, whilst her contemporaries were uniformly exhibiting a long, thick, black pennant of dense smoke. Her consumption of coals for a ten hours' run, including getting up at starting, was about 7,500 lbs. weight, or ninety bushels Winchester measure.

This mode of construction, until after the burning of the Regent, was supposed to be a sufficient protection to the deck of the vessel, through which the chimney rose. The discussions on that subject led the late superintendent of that vessel, to suggest the insulating the chimney itself from the boiler, for a few feet above deck, by a ring of water, within an exterior jacket, round the chimney, to be fed by a small pump with the warm water from the air pump cistern; the heat thus abstracted from the chimney tube being accumulated in the water, the latter was forced into the boiler by a second pump. Mr. Brown carried this plan into operation in fitting up the Caledonia, and the attendant success caused it to be generally adopted during

the succeeding winter. This is now a regular portion of the equipment of an English steamer, though, lately, some have thought proper to employ an air tube only around the chimney.



The diagrams 1, 2, 3, 4, will illustrate the foregoing remarks. 1 is the boiler front; 2, the plan of the pits and flues; 3, a longitudinal, vertical section; 4, a vertical cross section; *a*, the ash pits; *b*, the fire doors; *c*, the fire bars; *d*, the dead plate; *e*, the bridge of the flue pit; *g*, the flues; *h*, the chimney tube; *i*, openings to clean the flues and pits, to water line. This was the general construction adopted in the Caledonia, and it has since continued to be the one most approved. There have been, however, some variations, the most important of which will be noticed in the course of our remarks.

We now resume our narrative for 1818, beginning with the Victory. This vessel was about 110 feet by 23, was fitted with two thirty inch cylinders, of three feet stroke, acting each by a cross head, and side rods extending to two inverted bell-crank beams, connected to a middle shaft, having a pair of right angled cranks, one on each end; these were connected by a pair of crank links, to the cranks on the wheel shafts; the other dimensions of these engines were not taken by the writer. The boiler was of a low wagon form, having two eliptical furnaces and upper flues returning to the chimney. The engine was, unfortunately for Dodd who arranged the plan, very disproportionate in its parts; and the owners had committed the error of employing Dickson to build it, because he offered to do it for £1200 less than Boulton & Watt, and £1000 less than Maudslay. Thus cramped in price, and not having tools or machinery to do such engines justice in making, Dickson's workmanship added to the evils of Dodd's arrangement; and in four months after its beginning to work, one of the owners admitted, publicly, that Dickson's bill for repairs came to £800. The consumption of coal was great, and the wheel

shafts, being of cast iron, occasionally broke, from a cause which we are now to explain.

It was an unsettled point. whether a steamer was best, built with a plain side, and wheel guards formed by the prolongation of the deck beams, supported by knees and braces, or built with these, and a fitting out beneath the guard. Where these latter had been adopted, the vessels had scuttles from the deck, which converted the spaces below into store lockers, for loose and small articles.—These had been built on after the vessel was otherwise finished, and were called sponcings. Where steam vessels had been built on the first plan, the cabins had had the best light and air, by means of the side ports. Dodd proposed to fit the Victory with these advantages united, by building the sponcings as a component part of the vessel, by which he gained light and air, and also space to fit additional tiers of sofas, or lounges, which, in a crowded day-vessel, were great additional conveniences. But, in trying to avoid his errors in the Majestic, he fell into the opposite extreme, and the Victory was too slightly built to stand the sea she frequently had to encounter between the mouth of the Thames and Margate; the form of the sponcings, also, caused her motion, in rough water, to be a succession of jerks, alike injurious to the frame of the vessel, and to the machinery, but particularly to the cast iron wheel shafts.

The Victory, when in good case, and in fair weather, was an equal match for her competitor, the Favourite, the next to be noticed in our narrative. Each made its average passage in about seven hours, and they were believed to exceed nine miles an hour in speed. The Favourite was not materially different in size from the Victory, though somewhat smaller. The main differences were in the form of the vessel's cross section, which, although it did not allow of so much internal accommodation as the Victory, prevented those jerks to which she was subject in rough water; and in the engines, which being constructed on the principles already elucidated in our description of the mode adopted by Messrs. Boulton & Watt, in the Caledonia, gave her yet further material advantages over the Victory in bad weather. Still, notwithstanding this general superiority over the Victory, the Favourite occasionally broke a cast iron wheel shaft; an attempt was made to prevent this, by substituting hollow cylindrical shafts, of larger size, containing about the same weight of metal as the original solid shafts; these stood better than the solid, but, breaking at last, it became manifest that a wrought iron shaft could alone be depended on for a sea vessel; and both of them were thus equipped, during the following winter.

When about building the steamer called the City of Edinburgh, Boulton & Watt had been associated with Messrs. Wagram & Co., ship-builders in London, whose business had hitherto consisted mainly in the building of large ships for the East and West India trades; and these gentlemen having taken shares, claimed a voice in the construction, and, contrary to Mr. Wager's advice, are said to have nsisted on a more bulky form, and increased strength in materials,

beyond any former practice, preferring to sacrifice considerably in speed, that there might be no failure in safety, under the strain of a powerful pair of steam engines, when contending against the singular agitation caused by a storm, in the German Ocean. Subsequent experience showed the errors of this otherwise correct feeling, to have consisted in the excess to which it was carried.

Much caution was used, to prevent strangers from learning the real sizes and proportions of her engines, but they had about thirty inch cylinders, with forty inches stroke; the paddle wheels worked as in the Caledonia, having two revolutions for each three whole strokes of the engine, and were about fourteen feet in diameter; this vessel, it is said, never reached a speed, in still water, quite equal to eight miles per hour. On taking her station this year, in the passage trade between London and Leith, her average passages were about seventy-five hours; and by offering a safe, and tolerably certain, steam communication, with London and Edinburgh, she received a good share of public favour. Her guards were fitted with projecting beams, not extending the whole length of the vessel's sides, and they were blocked by small sponcings wrought on. She had two schooner-rigged masts, with fore and aft sails, on each, and a square-sail to set forwards, but was not in any other way peculiar in her construction.

[TO BE CONTINUED.]

The Hydrostatic Paradox.

BY THE EDITOR.

When a gentleman allows his name to go before the public as the inventor of something new in mechanics, however grossly he may sin against the laws of nature, in the principles which he assumes, we are compelled to suppose that he is sincere, and self-deceived. The quack in medicine may or may not believe in the virtues of the nostrum which he prescribes, and even should his patient die, this may result from his own perverseness, and not from any fault in the panacea; not so, however, with mechanics; if a perpetual motion makes a dead stand, it appears before us self-condemned; and so of machinery in general, when it has been made by a competent workman, on a scale sufficiently large, we may then learn what it will, and what it will not do. This, fortunately, however, is not the only guide; there are certain known principles, a connexion between effects and their causes, which have been fully investigated by the instructed mechanician, and which serve him as land-marks in all his proceedings; when an individual is not under the guidance of these principles, he may, by accident, take the right road; but the chance is, that he follows some "Will with a wisp," and finishes his journey in a quagmire.

The good citizens of New York, on the 23d of September last, had their attention invoked to a magnificent scheme for obtaining motive power, in a way so cheap, so safe, and so efficient, as to *promise* to

supersede all the expensive and elaborate means now in use; and "it is not known that this has ever before been effected, either in this country, or in Europe." By the use of the word "before," we might be led to suppose that the Rev. Mr. Edson has not merely conceived the idea in his own mind, but has actually tested its correctness; but, most assuredly, this term has been used prematurely. He may have "seen visions," or "dreamed dreams;" but, like some other dreams, they must be interpreted by "the rule of contrary." Although the things proposed have never been "effected, either in this country, or in Europe," there have been numerous schemers, who have seen fortunes in reversion, which they were to derive from the application of this paradoxical power; but, as "dead men tell no tales," so also the still-born children of mechanical genius never cry, and are soon buried.

We have written this long preface to the subjoined notice, in consequence of the application of a gentleman in New York, who had simultaneously been engaged in a similar scheme, and who was led from this publication to fear that he might meet with a rival in his enterprises; but for this, we should have passed over this magnificent announcement, as we do numerous others, every year, which make their first appearance in the daily journals, and are never more seen upon the stage. Should our friend be anticipated in the trial of the experiment, we shall congratulate him on two accounts, at least—the saving of money, and the saving of reputation.

From the New York Daily Advertiser.

Messrs. Editors,—The Rev. Ambrose Edson, of Berlin, Conn., having been laid aside from his professional labours, in consequence of a bronchial affection, has recently directed his attention to the subject of Hydrostatic Pressure, and has succeeded in devising a method for the application of this powerful principle to propel machinery. It is not known that this has ever before been effected, either in this country, or in Europe. The extent to which the power of the Hydrostatic Pressure may be carried, may be understood from the simple statement of the fact, that, by it, a single *pint* of water may be made to produce a pressure equal to ten, twenty, sixty, or one hundred tons weight, according to the proportional dimensions of the apparatus used for the purpose. Indeed, the only limit to the extent to which this pressure might be carried, results solely from the impossibility of finding any material of sufficient strength to confine it. In the inventor's application of a principle of such tremendous power, (hitherto almost entirely useless to the world, except in the construction of the Hydrostatic Press,) to machinery, but a very small quantity of water is used for the largest factories—the whole of which may be taken from any common well, and after being used once, it is conducted to a reservoir, from which it is again taken, and applied in the same manner, and the repetition continued for any length of time desired. No additional supply will be needed, except to make up the deficiency of what evaporates, and leaks out, from day to day.

It will readily be perceived, that by the improvement introduced by such an application of the hydrostatic power, running streams, with head and fall, are not necessary even for the largest mills and manufacturing establishments. These may be erected on the surface of the smoothest and smallest ponds, or pools of water; nay, even at a distance from *these* conveniences, or any elevation of land, whereon water can be procured in wells sufficient for ordinary domestic purposes. On the score of *economy*, too, this new application of a principle long known to the world, will have much to recommend it. The enormous sum sometimes paid for a valuable water privilege, will be saved, as well as the expense of erecting, and keeping in repair, dams, flumes, water wheels, &c., even where water power, in the common method, can be obtained. Its advantage over *steam* power, too, is obvious, as it requires no *fuel* to produce, and sustain, a pressure equally great, less violent, and much more easily managed, without *any risk of life and property by the explosion of boilers.* It is, evidently and literally, A COLD WATER PRINCIPLE. Hence, "*Hydrostatic Pressure Boats*" will have a decided advantage over steamboats, arising from the perfect safety of using the power, the saving of all the expense incurred for producing and supporting steam pressure, and also the fact that a Hydrostatic Pressure Engine will be much less expensive than a steam engine.

It is expected that the citizens of New York may have an opportunity of testing the correctness of the foregoing statements, by a personal examination of a model of a Hydrostatic Pressure Engine, in the course of a few weeks.

CONNECTICUT.

Remarks on the Syphon. *By* THOMAS EWBANK, *of New York city.*

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—Since writing the communication respecting the syphon, which was inserted in the July number of this journal, I have devoted some leisure to the same subject, upon which I now submit to you a few remarks.

The following observations apply to the form of syphon described, page 3, in the communication above referred to.

It occurred to me that this syphon might be occasionally used in the arts, with advantage, as a *cock*—in oil and starch factories, breweries, sugar works, &c. For example, suppose it were attached to a standing cask, the smaller leg being connected either to the lower part of its side, where a cock is commonly placed, or inserted through the top: when it is charged, by lowering the straight tube, any required quantity of liquid is discharged, and it is instantly stopped by sliding up the tube. Some simple contrivance for retaining it there, may be easily attached to the upper part of the cask. The discharge also may be increased or diminished, by lowering or raising the straight tube.

In this manner it acts as a cock, and with one peculiar advantage, for it is neither liable to leak, or get out of repair.

It is also a *gauge* for ascertaining, at all times, the quantity of liquid in the vessel to which it is applied, viz: by indicating the surface of the fluid; thus, by gently lowering the straight tube, till the fluid begins to flow, its surface in the vessel, and in the straight tube, (or the aperture of the spout, if it be straight,) will be on the same level. In vol. ii. of the Journal, page 414, is a description of a gauge for stand casks, from the "Transactions of the Society of Arts." It consists of a glass tube connected to the cock at the bottom of the cask, and extending to the top of it; the surface of the liquid being on the same level in both. This syphon will answer both the purposes of the cock and gauge in that apparatus.

It has, however, one prominent disadvantage, when used either as a cock or syphon; for it requires a space sufficient to receive the movable tube, as far below the bottom of the vessel, as is equal to the depth of the fluid in it.

When the depth of the fluid to be withdrawn, is such as to reach up to within, or about three inches of, the bend, (of the small syphon sent,) it may be used *without* the movable tube. In such cases, close the orifice of the *small* leg with the finger, and place the large leg into the liquid, as above; then withdraw the finger *suddenly*, and the liquid will rise to be discharged through the syphon. As this effect is owing to the sudden expansion of the air, it is necessary to withdraw the finger at once, otherwise the air, by expanding gradually, would not produce the same effect. Possibly a greater rise of the fluid may be obtained by altering the relative proportions of the legs. Such would, in some degree, be the case, if the syphon were formed of glass. In speaking of the syphon of M. Collardeau, (p. 336, vol. ix.) I ought, in my last communication, to have mentioned that my experiments were made with syphons formed of leaden, tin, and copper tubes; had I used those made of glass, the effect would doubtless have been the same as is described by himself.

There are two other methods of charging this kind of syphon, without the movable tube, but they are not likely to be of any practical utility. As they may perhaps be considered as adding to the variety of modes of using this instrument, I submit them to your consideration.

1. If you take hold of the middle part of the small leg, and plunge the other into the liquid, which must be within three inches of the top of the vessel, it will be charged. In doing this, the large leg should describe an arc, the centre of which will be the part held in the hand. It is performed much readier in this manner, than in plunging it perpendicularly. It requires some address, but is easily done, when the art is once acquired.

2. When the fluid is too low in the vessel to be discharged as above, it may be accomplished to a limited extent, thus:

Suppose A the vessel, and B the surface of the fluid in it. P is a pipe closed at the bottom, but perforated with a number of small holes, the sum of whose areas must not exceed that of the orifice of the small leg of the syphon. The large leg is made to slide easily into P, and, at the

same time, to fill it. P is then placed into the vessel, as represented, and the fluid, passing through the small holes, stands at the same height in it as in the vessel. The large leg is quickly dropped into P and the fluid displaced by it will rise and charge the syphon. If the large leg be placed gradually into P, no effect would follow, because the fluid would have time to descend to its level through the small holes.

Another mode of using the syphon for transferring acids, occurred to me, and which I have found to answer. You are aware that the silversmiths make small syphons for withdrawing wine from bottles, &c., which are frequently accompanied with small exhausting syringes, for the purpose of charging them. The one proposed has a substitute for this syringe.

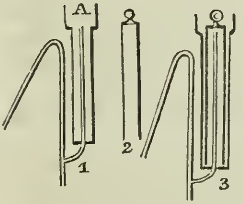


Fig. 1 represents a common syphon, with a small tube attached to its longest leg, similar to the common sucking tube. It is made to pass through the centre of a larger tube, A, which is closed at the bottom. This tube is filled with water (or other fluid) to the top of the small tube. 2 is a tube closed at its upper end. Its internal capacity should be about twice as great as that of the syphon. It is made to slide in the tube A, as shown at 3. To use it, fill A with water, then place the short leg into the liquid to be withdrawn; after which, close the orifice of the other leg with the finger, and raise the tube 2, till the syphon is filled; then let 2 descend as at 3.

Examination of Dr. Herschel's Theory of the Constitution of the Sun. By V. Value.

The sun, the acknowledged centre of our planetary system, offers such an important subject of contemplation, that it has always excited the admiration, wonder, and gratitude of mankind. As it is, for us, the focus of light and heat, it was natural enough to consider it as a globe of fire, as a mass of ignited matter, from which we derived the most important benefits; and therefore we find it, as the soul of the universe, worshipped from the remotest antiquity. In the eyes of its adorers, it was the deity itself, and, without presuming to investigate the nature of its constitution, they supposed it to be self-existent, and, of course, eternal, incombustible, indestructible. When the knowledge of the true God taught mankind to look upon the sun as the work of his hands, that luminary became mere matter, and, of course, a proper subject of investigation. One of the first and most obvious inquiries was, *By what means could such an immense fire be fed?* However easy and natural the question might be, its solution did not the less remain a mystery for us. We felt the genial warmth of the sun, and could not, without rejecting the conviction of our senses, consider it otherwise than as a globe of fire. Hence, conjectures, hypo-

theses, theories, succeeded each other, to establish its fiery nature; ingenious and learned calculations were made, to show that the immensity of that globular furnace could, without any sensible diminution, supply the inconsiderable quantity of light and heat it diffused around. So that, with the universal consent of Italian, German, Prussian, English, French, and American astronomers, the sun was considered as a globe of fire, until, in 1794, the learned and indefatigable Dr. Herschel, with one powerful effort of his gigantic genius, deprived it of its inflammability, and converted it into an opaque body. In the 16th century, (1530,) the crystal heavens of Aristotle had melted away under the calorific power of the sun, as the centre of our planetary system; in the 18th, that luminary was divested of its very caloric. So fluctuates human wisdom!

My intention is to present a few observations on the theory advanced by Dr. Herschel. As, in every new elementary book, it appears to be presented without comment, and, of course, as the most probable conjecture, it is well, perhaps, to examine its bearing.

In the London Philosophical Transactions, for 1795, Dr. Herschel has given an explanation of his views.

He says,—"The sun, like the planets, is an opaque, or dark body, surrounded by a vast atmosphere, containing clouds created by the constant and extensive decompositions of its elastic fluids; and that those clouds are of a phosphoric nature, and attended with lucid appearances, by giving out light." But he supposes that the rays emitted by that luminous substance contain no heat, because, if they did convey all the heat we feel, they ought to act with more effect when their course is less interrupted, viz: on the tops of high mountains; we know, however, from observations, that these are constantly covered with snow. Moreover, the intense cold experienced by æronauts who have ascended to any considerable height, corroborates the hypothesis that the rays of the sun are divested of caloric.

Hence, the Doctor thinks that we receive light, not from the opaque nucleus of the sun, but from its luminous atmosphere, and that the rays which convey that light contain no heat, when they emanate from it. But when and how do they receive the heat they undoubtedly communicate to us? The Doctor very ingeniously explains it thus:

"Heat is produced by the sun's rays only when they act upon a calorific medium; they are the cause of the production of heat, by uniting with the matter of fire which is contained in the substances that are heated, as the collision of flint and steel will inflame a magazine of powder, by putting all the latent fire it contains into action."

The unavoidable conclusion to be drawn from what precedes, is, that the solar rays contain light, but no heat; that they traverse the immense distance, the 95,000,000 of miles that separate us from the sun, and reach the tops of our highest mountains, without experiencing any alteration; and that they could, unchanged, go to any given distance, even to Sirius, or the remotest of the fixed stars, for no alteration can take place in them, except they find a *calorific medium* with which

to unite. That calorific medium is, with the earth, and, we may presume, with every other planet, the denser strata of the atmosphere.

From the Doctor's premises, viz: that the sun's rays carry no heat, but that they receive it from our atmosphere, we infer, that—

1. The solar rays, on account of their obliquity, in the morning and evening, ought to disengage more heat than at noon.

2. That, for the same obliquity, the heat ought to be more intense in winter than in summer.

3. That the light from the fixed stars ought to produce as much heat as the sun's, if not more.

4. That the planets ought likewise to impart to us a degree of heat proportional to their atmosphere.

All these conclusions contrast so strongly with the unerring results of our experience, that they will be rejected at once. Yet, if fairly deducible from the Doctor's theory, they ought to be adopted, or else the theory should be discarded.

I will now proceed to show that these inferences are the natural consequences of the above hypothesis of Dr. Herschel.

1. The solar rays, according to the learned astronomer, are cold when they emanate from the sun; they shine upon the summits of our highest peaks, without acquiring sufficient heat to melt snow; and yet those rays, near the surface, will raise the thermometer to 120° Fahrenheit. That difference of heat must then be received in the passage through the denser portions of our atmosphere, and it must be, as the Doctor says, on account of "*uniting with the matter of fire therein contained.*" This is the important point.

Since those rays become calorific only when in contact with the denser strata of our atmosphere, it follows, that the longer that contact continues, the hotter the rays must become. Hence, when the sun's rays fall obliquely, as they then receive the heat of a greater quantity of the *matter of fire*, or unite with a greater portion of it, they ought to be hotter. But is that the result? Experience is here in direct opposition to the theory. Every morning and evening, the rays fall in an oblique direction, and yet we know that the temperature is not then of the highest degree.*

2. The same reasoning applies with equal force to the position of the winter rays, their obliquity being greater in that season than in summer.

As our atmosphere is the chemical laboratory of heat, which is disengaged from it by *cold light*, is it not reasonable to suppose that, from whatever source we obtain that cold light, the result must be heat? If so,

3. The rays of light from the fixed stars ought, when in contact with our dense atmosphere, to produce a heat equal to the sun's rays.

This idea will seem so preposterous, it is so contrary to daily ex-

* On account of the same obliquity, the temperate zones should be more heated than the torrid, and the frigid zones still more than the temperate, whenever the solar rays reach them.

perience, that it will be instantly ridiculed. Yet it appears the unavoidable consequence of the new hypothesis. By it, light denuded of caloric, emanates from the sun's atmosphere, and flies in every direction, whether it goes one hundred miles, ninety-five millions, or one hundred billions of miles, its component parts must remain the same, until a proper medium of combination offers, and then, *heat* must be the inevitable result.

The fixed stars are suns, by the Doctor's own admission; their bodies must be opaque; but since they emit light, it must, like the solar light, be self-created; their atmosphere must, of course, be luminous and phosphoric, and, consequently, their light similar to the sun's. And, although that light traverses an immeasurable distance, it is yet unchanged when it reaches our atmosphere, and ought then to produce heat, on entering our denser strata.

But it may be said that the rays, sent by each individual star, are not sufficient to effect any change of temperature. Granting this, it cannot be denied that we receive, at the same moment, millions of millions of rays from the innumerable stars which adorn the firmament, and that their aggregate quantity must, at least, equal the sun's emanations to us, and ought, in consequence, to generate as much heat. Is not this a fair and natural deduction from the premises?

4. Since the *cold rays* disengage heat from our atmosphere, how does it happen that the moon's rays, coming through the same medium, (the generating medium,) do not produce a similar effect? Because, it will be immediately answered, it is a mere reflected light. Hence, we must admit two kinds of light—the sun's primitive light, and the moon's reflected, or secondary light. How do they differ? As long as the sun's rays were supposed to contain light and heat, it was natural to infer that, the heat being absorbed by the body of the planet, the reflected light could no longer retain it, and, of course, it was cold; but when the solar rays are, by the new system, deprived of caloric, being cold, how can they differ from the light of the planets? This is not explained by the Doctor.

Since we have no light of our own, if we reflect any, it must be the sun's. This will be readily conceded; but it may be said that it will be the sun's light, modified in its passage through our atmosphere. Let us examine this objection. The only modification light undergoes, is the accession of caloric. Hence, if the earth sends forth any light, it must be *heated light;* and, since there is nothing to interrupt its course between the moon and us, it must reach our satellite as it leaves us, viz: loaded with heat. We must then impart a considerable degree of heat to the lunar inhabitants.

What we have just said of the earth, and its reflected rays, is applicable to the moon, and to every other planet. Hence, their light ought to convey heat to us.

The consequence from the Doctor's premises would be, that the earth and planets send forth *calorific rays*, while the sun transmits *cold rays*. Such is the absurd, though inevitable deduction, the new theory would lead to—a conclusion wholly contrary to experience;

for the most accurate observations have proved that rays from the moon and planets produce no sensible heat on the earth.

If these inferences are correct, it is evident that the Doctor's hypothesis is erroneous, and that we must either re-adopt the old received idea of the sun being a mass of ignited matter, or else, admitting, with the celebrated astronomer, that light issues, not from the sun's nucleus, but from its lucid and phosphoric atmosphere, endow that light with heat, and then form some new conjecture or solution to explain why the solar rays do not heat the upper part of our atmosphere.

That solution appears almost self-evident, from the theory of atmospheric pressure in Turner's Elements of Chemistry, with notes, by the distinguished Professor, Franklin Bache, (page 153, 4th American edition.)

Information to persons having business to transact at the Patent Office.

DEPARTMENT OF STATE,
September 30th, 1834.

The Acts of Congress, of a general nature, which relate to Patents for Inventions and Improvements in the Useful Arts, are those of February 21st, 1793; April 17th, 1800; February 15th, 1819; July 3d, and July 13th, 1832.

Patents are granted for "any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter, not known or used before the application." [Act of 1793, sec. 1.]

The term for which a Patent is granted, is fourteen years. A patent cannot be prolonged or renewed beyond that term, except by a special Act of Congress.

Patents may be granted to *citizens* of the United States. [Act of 1793, sec. 1,] to *aliens* who shall have resided therein for two years, [Act of 1800, sec. 1,] and to *aliens* " who, at the time of petitioning for a Patent, shall be resident in the United States, and shall have declared their intention, according to law, to become citizens thereof." [Act of July 13th, 1832, sec. 1.]

A Patent granted to an alien of the description last mentioned, will be void, if the invention is not introduced into public use in the United States within one year; or if, for any period of six months after such introduction, it shall not continue to be publicly used and applied in the United States; or if the inventor shall fail to become a citizen of the United States at the earliest period at which he may be entitled. [Act of 13th July, 1832.]

Joint inventors are entitled to a join patent: but neither can claim one separately.

A Patent obtained surreptitiously, or upon false suggestion, will be set aside upon application to the proper court. [Act of 1793, sec. 10.]

In case of the decease of an inventor, before he has obtained a Patent for his invention, "the right of applying for and obtaining such a Patent, shall devolve on the legal representatives of such person, in trust for the heirs at law of the deceased, if he shall have died intestate; but if otherwise, then in trust for his devisees, in as full and ample manner, and under the same conditions, limitations, and restrictions, as the same was held, or might have been claimed or enjoyed, by such person in his or her life time; and when application for a Patent shall be made by such legal representatives, the oath or affirmation shall be so varied as to be applicable to them." [Act of 1800, sec. 2.]

"It shall be lawful for any inventor, his executor or administrator, to assign the title and interest in the said invention, at any time; and the assignee having recorded the said assignment, in the office of the Secretary of State, shall thereafter stand in the place of the original inventor, both as to right and responsibility; and so the assignees of assigns to any degree. [Act of 1793, sec. 4.]

On the Application for a Patent.

The application for a Patent must be made by petition to the Secretary of State, signifying a desire of obtaining an exclusive property in the invention, and praying that a Patent may be granted therefor, [Act of 1793, sec. 1,] which petition may be in the following form:

To the Secretary of State of the United States:

The Petition of — ———, in the County of ————, and State of —————, respectfully represents:—

That your Petitioner has invented a new and useful improvement in ———————, which has not heretofore been known or used; the advantages of which he is desirous of securing to himself and his legal representatives; he therefore prays that Letters Patent of the United States may be issued, granting unto your petitioner, his heirs, administrators, or assigns, the full and exclusive right of making, constructing, using, and vending to others to be used, his said invention, [improvement, art, machine, manufacture, or other composition of matter as the case may be,] agreeably to the Acts of Congress, in such case made and provided; your petitioner having paid thirty dollars into the Treasury of the United States, and complied with the other provisions of the said Acts.

[The name of the petitioner to be subscribed.]

The Description or Specification.

Before the petitioner can receive a Patent "he shall deliver a written description of his invention, and of his manner of using, or process of compounding the same, in such full, clear, and exact terms, as to distinguish the same from all other things before known; and to enable any person skilled in the art or science of which it is a branch, or with which it is most nearly connected, to make, compound, and use the same. And in the case of any machine, he shall fully explain the principle, and the several modes in which he has contemplated

the application of that principle, or character by which it may be distinguished from other inventions." [Act of 1793, sec. 3.]

The following form may be used for the preamble of the description or specification:

To all to whom these presents shall come: Be it known that I, ————, of ———— in the county of ———— and State of ————, have invented a new and useful ———————— and that the following is a full and exact description thereof: [Here follows a description of the "art, machine, manufacture, or composition of matter."]

In drawing up the specification, particular attention must be paid to the requirements of the law. The following general directions upon this subject embrace those points which appear to be most important.—

If the specification does not contain the whole truth relative to the discovery, or if it contain more than is necessary to produce the desired effect, and if such concealment, or addition, shall fully appear to have been made for the purpose of deceiving the public, the Patent shall be void.

No more must be claimed in the specification than is the invention, or discovery, of the applicant. Many patents have been vacated in consequence of inattention to this last rule. In many cases it may be proper for the applicant to describe a whole machine in the specification, although parts of it may not have been invented or discovered by him, or may have been previously known; as it might otherwise be difficult to make known the improvements: but after doing this, he should distinctly set forth what he claims as not previously patented. This may be done best in a separate paragraph, at the end of the specification, as follows:

What I claim as my own invention, and not previously known, in the above described machine, is, &c., &c.

This is necessary to a compliance with the 3d section of the Act of 1793, which requires the inventor to distinguish his invention from all other things before known.

In regard to improvements, the 2d section of the act of 1793 provides that "any person who shall have discovered an improvement in the principle of any machine, or in the process of any composition of matter, which shall have been patented, and shall have obtained a Patent for such improvement, shall not be at liberty to make, use, or vend the original discovery;" and that "the first inventor shall not be at liberty to use the improvement;" and the same section declares, "that simply changing the form or proportions of any machine, or composition of matter, in any degree, shall not be deemed a discovery." The 3d section requires that the specification or description should be signed by the applicant, and attested by two witnesses, and that it should be filed in the office of the Secretary of State.

A defective description or specification may be amended, or it may be withdrawn, and another substituted by the applicant before the issuing of the Patent. If, after the issuing of a Patent, the inventor shall discover that his specification or description is imperfect, or that

he has in any particular omitted to comply with the terms and conditions of the 3d section of the act of February 21st, 1793, he may surrender such Patent and receive another, agreeably to the 3d section of the Act of July 2d, 1832, which provides that whenever a patent is invalid or inoperative, by reason that any of the terms or conditions prescribed in the 3d section of the said first mentioned Act," [that of February, 1793,] "have not, by accident, inadvertance, or mistake, and without any fraudulent or deceptive intention, been complied with on the part of the said inventor, it shall be lawful for the Secretary of State, upon the surrender to him of such Patent to cause, a new Patent to be granted to the said inventor, for the same invention, for the residue of the period then unexpired, for which the original Patent was granted, upon his compliance with the terms and conditions prescribed in the said 3d section of the said Act. And in case of his death, or any assignment by him made of the same Patent, the like right shall rest in his executors, administrators, assignee, or assignees."

Every inventor, if a *citizen* of the United States, before he can receive a Patent, must swear or affirm that he does verily believe that he is the true inventor or discoverer of the art, machine, or improvement, for which he solicits a Patent, which oath or affirmation may be made before any person authorized to administer oaths. This oath or affirmation may be in the following form:

County of ——, }
State of ——, } ss.

On this —— *day of* ——, *in the year* 18—, *before the subscriber*, (insert the official designation of the person administering the oath) *personally appeared the within named* ——, *and made solemn oath* (or affirmation) *according to law*, *that he verily believes himself to be the true and original inventor of* (insert the title of the invention or improvement) *and that he is a citizen of the United States.*

If the applicant be an *alien*, but shall have resided for two years in the United States, the words "and that he is a citizen of the United States," must be omitted, and the following substituted:

"*And that the same hath not*, *to the best of his knowledge or belief*, *been known or used in this*, *or in any foreign country*, *and that he hath resided for two years in the United States.*"

If the applicant, being an alien, shall not have resided for two years in the United States, but shall have given notice of his intention to become a citizen thereof, instead of the words "that he hath resided for two years in the United States," must be substituted the following:

"*And that he hath given legal notice of his intention to become a citizen of the United States.*"

When application for a Patent is made by the legal representatives of a deceased inventor, the oath or affirmation is to be so varied as to be applicable to them. [Act of 1800, sec. 2.]

Of Drawings, Models, and Specimens of Ingredients.

The law requires that "the applicant for a Patent shall accompany" his application "with drawings, and written references, where

the nature of the case admits of drawings." [Act of 1793, sec. 3.] These drawings should be according to the rules of perspective, and neatly executed; and such parts as cannot be shown in perspective, should, if important, be represented in section or detail. When the specification refers to the drawings, duplicates of them are required. Drawings are necessary even though a model be sent.

Where the application is for a Patent for a machine, the law requires that "the inventor shall moreover deliver a model of his machine, provided the Secretary shall deem such model to be necessary." [Act of 1793, sec. 3.] By a regulation prescribed by the Secretary of State, some years ago, and still continued, a model is required in all cases. The model should be neatly made, and as small as a distinct representation of the machine, and its intended properties will admit; and the name of the inventor should be printed upon, or affixed to it, in a durable manner.

Where the invention is of "a composition of matter," the law requires that the application be accompanied "with specimens of the ingredients, and of the composition of matter, sufficient in quantity for the purpose of experiment."

Of Interfering Applications.

"In case of interfering applications, the same shall be submitted to the arbitration of three persons, one of whom shall be chosen by each of the applicants, and the third person shall be appointed by the Secretary of State; and the decision or award of such arbitrators delivered to the Secretary of State, in writing, and subscribed by them, or any two of them, shall be final as far as respects the granting of the Patent. And if either of the applicants shall refuse or fail to choose an arbitrator, the Patent shall issue to the opposite party.—And where there shall be more than two interfering applications, and the parties applying shall not all unite in appointing three arbitrators, it shall be in the power of the Secretary of State to appoint three arbitrators for the purpose. [Act of 1793, sec. 9.]

Before an application can be referred, the applicant must have done all which the law requires him to do previously to the issuing of a Patent.

Fees payable in the Patent Office.

"Every inventor, before he presents his petition to the Secretary of State, signifying his desire of obtaining a Patent, shall pay into the Treasury, thirty dollars; and the money thus paid shall be in full for the sundry services to be performed in the office of the Secretary of State. [Act of 1793, sec. 11.]

This requirement of the law will be complied with, by a payment made to the Treasurer of the United States, at Washington, or to his credit in any one of the selected deposite Banks. In either case, duplicate receipts must be taken, stating by whom the payment is made, and for what object, one of which receipts must accompany the petition.

The practice which has heretofore existed in some cases, of sending

the money to the Secretary of State, or the Superintendent, is not in conformity with the law, and is to be discontinued.

"For every copy which may be required, of any paper respecting any Patent that has been granted, the person obtaining such copy shall pay at the rate of twenty cents for every copy sheet of one hundred words, and for every copy of a drawing, the party obtaining the same shall pay two dollars." [Act of 1793, sec. 11.]

For authenticating a copy of any paper under the seal of the Department, a fee of twenty-five cents is required by law to be paid. The recording of transfers is charged at the same rate with the copying of Patents.

The fees for copies of Patents, and of papers or drawings relating to them, and for recording transfers, must be paid at the time the copying or recording is ordered.

Of the Renewal of Patents.

The 2d section of the Act of July 3d, 1832, provides "that application to Congress, to prolong, or renew, the term of a Patent, shall be made before its expiration, and shall be notified at least once a month for three months, before its presentation, in two newspapers printed in the City of Washington, and in one of the newspapers in which the laws of the United States shall be published, in the State or Territory in which the patentee shall reside. The petition shall set forth, particularly, the grounds of the application. It shall be verified by oath; the evidence in its support may be taken before any judge or justice of the peace; it shall be accompanied by a statement of the ascertained value of the discovery, invention, or improvement, and of the receipts and expenditures of the patentee, so as to exhibit the profit or loss arising therefrom."

Caveats are not recognised by the Patent laws of the United States. But papers containing descriptions of discoveries or inventions, claimed as new, may be filed in the office at any time before an application for a Patent is made. They will be so far useful as to show subsequent applicants whether they have been anticipated in their inventions. These papers, when filed, are open to the inspection of the public, in the same manner as those relating to Patents.

Patents are issued in the order of time in which the proper documents are received at the Patent Office; but this rule applies only to cases in which the documents are complete.

Communications to and from the Superintendent of the Patent Office, are free of postage; and the petition to the Secretary of State, with the accompanying papers, may be transmitted directly to the Superintendent.

JOHN FORSYTH,
Secretary of State.

Notice to Persons Having Business with the Patent Office.

The Patent Law directs that "every inventor, before he presents his petition to the Secretary of State, signifying his desire of obtain-

ing a patent, shall pay into the Treasury thirty dollars; and shall take duplicate receipts, one of which receipts he shall deliver to the Secretary of State when he presents his petition."

It has been the practice, in many cases, to send the money above mentioned to the Secretary of State, or to the Superintendent of the Patent Office; but, in future, all applicants for patents, will conform to the directions of the law on the subject, and make the required payments into the Treasury.

It will be a compliance with the law, in this respect, to pay the money to the Treasurer of the United States at Washington, or to his credit in any one of the selected Deposite Banks. The receipts should state by whom the payment is made, and for what object.

It has also been the practice to transmit to the Patent Office papers describing new inventions and improvements, which the inventors have not yet completed, or for which they are not prepared to take out patents; and it has been erroneously supposed by those inventors, that by filing such papers in the office, they would prevent any other persons from obtaining patents for the like inventions or improvements. Sometimes the persons sending such papers have claimed to have them received as their private property, and as not liable to be seen by any one, except with their consent.

Caveats not being recognized by the patent laws of the United States, no papers will hereupon be received under such a claim; and those which have been heretofore deposited, if permitted to remain, will be open to public inspection. Persons, therefore, who have transmitted to the Patent Office, papers relating to inventions or improvements, unaccompanied by applications for patents for the same, which papers they claim as their private property, and as not subject to be seen by others, are requested to withdraw them.

JOHN FORSYTH,
Secretary of State.

Department of State, Oct. 3, 1834.

Notice respecting the foregoing Information to Persons applying for Patents.—By the Editor.

In the number of this Journal for November, 1828, vol 2, new series, p. 332, we published the circular of the Patent Office, giving "Information to persons applying for Patents, or transacting other business at the Patent Office. The information then given has been re-modeled by the Secretary of State, as will be seen in the preceding articles. This had become necessary in consequence of the passage of certain laws upon the subject, since that circular was issued, and also in consequence of some alteration directed to be made in the manner of transacting the business of the office, particularly as respects the payment of the Patent fee, and the disposition of papers lodged in the office by inventors previously to their being prepared to obtain patents, and usually denominated Caveats. Such papers were formerly kept private upon a request being made to that effect; they are henceforth, if placed on file, to be open to the inspection of those who wish to examine them, and will, therefore, be considered in the

nature of public notices that the thing described has been invented by the individual named in them

The change which has been made in the manner of paying the Patent fee, in order to make it conform with the legal provisions upon this subject, will be attended with considerable inconvenience to persons residing at a distance from any Deposite Bank. Several persons have, in consequence, transmitted the money to the Editor, for the purpose of having it paid into the Treasury of the United States; and he will very cheerfully transact this business for any of his correspondents, provided their letters come free of postage, and the money is such as will be taken in the Bank of the Metropolis, in Washington. As no fee will be charged for this, the whole transaction must be at the risk of the person remitting the money; the offer is made for the accommodation of those in whose pursuits the editor feels an interest, and is therefore willing, at the expense of a little trouble to himself, to relieve them from the difficulty above noticed, his residence in Washington, connexion with, and proximity to, the public offices, enabling him to do so.

FRANKLIN INSTITUTE.

Quarterly Meeting.

The forty-third quarterly meeting of the Institute, was held at their Hall, October 17, 1834.

Thomas Fletcher, Vice President, in the Chair.

Mr. Samuel Hufty was appointed Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

Donations of books were received from Henry Beaufoy, Esq., F. R. S., and Professor Faraday, of London—and from Messrs. Thos. Latimer, George Fox, Victor Value, B. H. Coates, M. D., and S. C. Walker.

Donations of minerals, from Messrs. John C. Trautwine, and Thos. Pearson.

Donations of models, from Mr. David J. Burr, of Richmond, Va., and Mr. Wm. C. Hughes, of Columbia, Penn.

The actuary laid on the table the various periodicals which had been received during the last three months, in exchange for the Journal of the Institute.

The chairman of the Board of Managers read the forty-third quarterly report, which was accepted, and referred to the Committee on Publications.

The Treasurer made his report of the funds of the Institute for the quarter ending Sept. 30th, which was accepted.

The Committee on Statistics made their report, which was accepted, and the committee discharged.

Extract from the minutes.

Thomas Fletcher, *Vice President.*

Samuel Hufty, *Rec. Sec. P. T.*

Forty-third Quarterly Report of the Board of Managers.

The Board of Managers respectfully offer their forty-third quarterly report:

The affairs of the institution continue in the same flourishing condition as stated in our former reports.

The Committee on Instruction are making every exertion to render the lectures and schools of the Institute worthy of the most liberal patronage. In addition to regular courses on Chemistry and Natural Philosophy, which will be rendered more than usually attractive, by the introduction of new and interesting subjects, arrangements will be made to occupy the evenings devoted to volunteer lectures, with matter that shall reflect credit on the Institute, and promote the cause of sound knowledge. The Drawing School will be placed under the joint superintendence of Messrs. William Mason and John M'Clure. Mr. Mason, who has been long and advantageously known to this community as one of the best instructors in drawing, needs not our praise; but it may be proper to state that we feel sensible that, in procuring the services of Mr. M'Clure, for the instruction of pupils in what may properly be called the practical part of architectural drawing, we have made an acquisition to the department of instruction, of no ordinary character. The Drawing School is now established on principles that render it at least equal to the best in this city, and the Board earnestly recommend it for the most liberal support.

The evening English school will be opened under the care of Mr. Seth Smith, whose faithful and zealous services in his department merit our warmest praise, and will, we hope, insure him more liberal encouragement than has heretofore been given. The Board have no hesitation in recommending this school as inferior to none in this city, for the instruction of apprentices in all the branches of a good English education, and, on a fair comparison with others, believe that it will be found the cheapest. The lectures will commence on Monday, the 27th day of October, and the schools as announced in the daily papers.

Since the last report, the Committee on Science and the Arts have held three stated meetings, and one special meeting. Besides the regular business, consisting in the examination of inventions by sub-committees, and the examination of their reports by the general committee, the committee have had before them a plan for a combined series of meteorological observations, to be made in different parts of our country. A sub-committee having met, and conferred with a similar committee on the part of the American Philosophical Society, an arrangement has been made, by which the influence of both associations will be directed towards the inquiries in view. To test the practicability of an extended plan of observations, the joint committee referred to have drawn up a circular, proposing certain points for examination and report by observers, and which, while they are both interesting and important, require but little aid from instruments. A copy of the circular is herewith submitted.

The monthly meetings, which were discontinued during the months of July and August, have been resumed. The meeting in September was a very interesting one, and was well attended.

The Reading Room and Library continues to attract the attention of members. Some valuable books have been added during the past quarter.

It is painful though necessary to refer to a subject in connexion with this department of the Institute, which was referred to the managers at the last quarterly meeting—namely, the practice of mutilating newspapers, pamphlets, and books. After a full investigation of this matter, the Board passed the following resolution:

Resolved, That any member detected in mutilating the newspapers, pamphlets, or books, belonging to the Institute, shall be deprived of his right of membership, and that the name of the offender shall be made public.

No cause of complaint having occurred since the period referred to, the Board hope that they will not again be called upon to notice the recurrence of a practice so disreputable to any member of the Institute.

During the past quarter, Mr. Wm. Hood, and Mr. David Hoopes, have been admitted life members of the Institute.

(Signed.) ALEXANDER FERGUSON,
Chairman.

WILLIAM HAMILTON, *Actuary.*

Circular in relation to Meteorological Observations, by the Joint Committee of the American Philosophical Society, and of the Franklin Institute.

The following circular having been issued by the Joint Committee on Meteorology, of the American Philosophical Society, and of the Franklin Institute, we take this opportunity to lay it before our readers, and to invite their attention to its contents.

COM. PUB.

PHILADELPHIA, Oct. 29, 1834.

SIR,—At a joint meeting of two committees appointed, one by the American Philosophical Society, and one by the Committee of Science and the Arts of the Franklin Institute of the State of Pennsylvania, to confer together on the best means of promoting the advancement of Meteorology, held at the Hall of the Franklin Institute, on the evening of the 9th inst., it was resolved that a sub-committee be appointed to furnish a project for certain simple observations, which may tend to elucidate important points in meteorology, and which may be at once entered upon, by observers in different parts of our country, and also to present a form of circular, to be forwarded to persons who may be considered competent to carry into effect the above objects.

In conformity with this resolution, and as a preliminary to the introduction of a more extended plan, which the joint committees are now maturing, the following circular has been prepared, and is for-

warded to you by the committee. The prime object of this circular is to obtain a complete knowledge of all the phenomena accompanying one or more storms of rain or hail, not only where the violence of the storm is felt, but at and beyond its borders, its beginning and its end.

For this purpose, you are requested, immediately on receiving this circular, to commence a journal of the weather, noting the direction of the wind at the surface of the earth, and in elevated strata, as indicated by the clouds, which may frequently be seen at different elevations, moving in different directions; the upper current of all being, at Philadelphia, generally from some western point. Let the strength and direction of the wind, and the appearance of the heavens as to clear or cloudy, and the character of the clouds, according to your own mode of description, be noted at least three times a day, as near the following hours as convenient—7 A. M., 2 P. M., and sunset. Let the heavens, however, be examined very often, so that any sudden change may not pass unobserved, especially in the direction of the wind; and when any occurs, let it be noted, with its time, under the general head of "observations."

The plan which we recommend in observing slow moving clouds, is to keep the head steady in one place, with the top of a chimney, or some distant fixed object, between the eye and any remarkable point of the cloud, until this point shall have moved so far from behind the object, as to leave no doubt of its direction.

As to upper and lower strata, when one passes under the other, there is an optical deception to be guarded against when the upper one moves with the greatest angular velocity. This deception may generally be avoided by noticing which cloud is obscured by the other as they pass. Sometimes, also, an upper current of air may be detected when there is but one stratum of clouds, if these are of the columnar, snowy-topped kind, which are frequently seen in a hot summer day; as these clouds are frequently formed between two currents, their tops will lean in the direction of the upper current, and, indeed, sometimes be blown off and dissipated, in a direction different from the air below.

We also particularly request, that if you hear of any storms occurring in your neighbourhood, you will collect all the information concerning them in your power.

Particularly inquire the course of the wind at the commencement of the storm, and at its termination; the width of the storm; its direction; its velocity; the direction of the wind at its sides; how the wind veers round—whether in different directions at its sides, or not; whether, in case of hail, there are two veins, or only one; where there is the greatest fall of rain, near the borders, or near the centre of the storm—and whether this fall takes place near the beginning, middle, or end of the storm; whether the clouds are seen moving with the wind, or against it, and whether differently among themselves; and every thing else which you think may tend to an explanation of this most interesting phenomenon.

Let the time of beginning and end of all rains be particularly noted, any change in the strength and direction of the wind during their progress, and the quantity, as near as possible. Mark the time of meteors, or shooting stars, and auroras, and, if possible, the stars through which they pass. These observations, if made by very many correspondents throughout the United States, will elucidate the main object which the committee has in view in the present circular, and it is hoped, greatly assist in giving interest and value to the plan in contemplation. But, as many observers may be willing to do more, we will remark that the observations on storms will be much enhanced in value, if accompanied by observations on the "Dew point;" for it may be, that hurricanes never occur only when the dew point is high.

A very simple as well as accurate method of taking the "Dew point" is, to use a thin tumbler of tin, kept very bright and clean on the outside—and, in the summer, cold water, and in the winter, snow or ice, and, if necessary, salt, mingled with water; and when these are not at hand, a mixture of muriate of ammonia, and nitrate of potash, in equal quantities, pounded very fine, put into the tumbler with water. By any of these means, a temperature may soon be obtained below the "Dew point." When dew settles on the tumbler, it must be carefully wiped off, very dry, and the fluid within stirred with a thermometer, and this must be repeated until the fluid is gradually heated up by the air, so that the moisture ceases to settle; the highest temperature at which it will settle, is the "Dew point."

For observations of the dew point to be of any value, however, they must be made constantly, every day, at least once a day.

Again, some may be unwilling to take the dew point, who would be glad to know that it may be obtained, approximately, by the following indirect method:

Take two thermometers that agree, or allow for the difference; cover one of them with a wet white rag, and swing them simultaneously in the air, (for it will not do to let them be at rest, unless the wind is blowing fresh;) when it is discovered that they cease to change by swinging, take 103 times their difference, and divide it by the wet-bulb temperature, and subtract the quotient from the temperature of the naked-bulb—the remainder will be the dew point. This formula is founded on experiments from 20° Fahr. to 80°, and does not differ, at either extreme, from the most careful experiments. We cannot refrain from saying, we are sure that every lover of the science will be richly rewarded for all the pains he may bestow on the dew point, even independent of the results which will undoubtedly be derived from a comparison of these simultaneous observations.

In conclusion, the committee request that, should your occupations prevent you from attending to the subject yourself, you will find in your vicinity a competent observer to take your place.

Please to forward your observations, monthly, to the *Joint Committee of the American Philosophical Society and Franklin Institute*, care

of William Hamilton, Actuary of Franklin Institute, Philadelphia, by mail, when a private conveyance is not at hand.

JAMES P. ESPY, *Chairman Joint Committee.*

GOUVERNEUR EMERSON, M. D.
C. N. BANCKER,
ALEXANDER D. BACHE, } *Com. of Amer. Philos. Soc.*

JAMES P. ESPY,
ALEX. D. BACHE,
H. D. ROGERS,
S. C. WALKER,
P. B. GODDARD, M. D. } *Committee of Franklin Institute.*

Monthly Conversation Meeting.

The first conversation meeting of the Institute, for the season, was held at their Hall, Sept. 25th, 1834.

Mr. L. Norcross, of Dixfield, Maine, exhibited his diving apparatus, with which he had made an experiment in presence of a committee of the Institute, at the Navy Yard. The apparatus consists of a water proof dress, of gum elastic cloth, and a metallic head-piece, with appropriate tubes for the admission of fresh air, and the escape of that vitiated by respiration. The air is forced in by a pump. A glass window in front of the head piece, enables the operator to examine any object, and his hands are at entire liberty.

Mr. Haydock, of Philadelphia, submitted to the examination of the members, a copper vessel, which had been used as a cistern, and connected with the city water works, and which, during that connexion, had collapsed. The explanation of this phenomenon is understood to have been given by Prof. Hare, to the Philosophical Society of this city.

A mortising machine, by Mr. John H. Chandler, of Worcester, Mass., was put in operation, and attracted much attention.

Prof. W. R. Johnson exhibited apparatus for determining the latent heat of melting iron, and the specific heat of the same metal in a state of fusion, which had been employed in connexion with his steam pyrometer, in recent experiments on those subjects.

Committee on Science and the Arts.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Plan for preventing accidents from the breaking of the axles of Rail-Road Cars and Locomotives, invented by Mr. Joseph S. Kite, of Philadelphia, REPORT:—

It is well known that the fracture of such axles almost invariably takes place near the nave, or hub, of the wheel, and the desideratum in such a case, is to preserve the two pieces of axle from *falling to the ground*, and, consequently, overturning the car. This, Mr. Kite

proposes to effect, by introducing in each car, two longitudinal pieces of timber, (which he calls *safety beams,*) inside of the wheels, and parallel to the usual string pieces, which support the boxes or chairs of the axles. To these inside beams, are attached an additional set of chairs, which, in order to avoid unnecessary friction, are so arranged as not to come into contact with the axle, except when the latter breaks.

When this happens, they arrest the descent of the pieces, and thus not only retain the car in an upright position, but may even permit it, in some cases, to proceed as before. These chairs are so constructed with double bearings, as to allow play to two axles of different diameters, the *smaller* bearing being for the axle *proper*, and the *larger* one for the *nave of the wheel;* which, if the break takes place immediately at the union of the hub and axle, becomes itself a *temporary* axle, upon which its attached wheel revolves, independently of the axle *proper*—the latter, with *its* wheel, being supported by the *smaller* bearing of the double chair. The wheels are prevented from separating transversely, by means of proper keepers outside of the chairs.

The committee consider Mr. Kite's arrangement both effective and simple, and consequently recommend it as deserving of practical test.

By order of the committee.

William Hamilton, *Actuary.*

June 12th, 1834.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Spirit Level, invented by Mr. Henry R. Campbell, of Philadelphia, REPORT:—

Considerable difficulty has hitherto been experienced in rail-road field operations, from the want of an instrument which might combine the common spirit level with a correct circle for laying off angles, with sufficient accuracy for the tracing of curves, and which, at the same time, would admit of pitching, or inclining, the telescope, without the necessity of throwing the parallel plates out of adjustment. In the tracing of curves, the union of these qualities is particularly desirable, the operation having hitherto generally required two separate instruments, viz: the common compass, and the spirit level. The former, besides never being divided with that degree of minuteness which is necessary for a proper execution of the work, allows, through its upright slits, a field of view entirely too large to define the points of curve in a satisfactory manner. Mr. Campbell's improved level obviates these disadvantages in a perfect manner. His improvement consists in the *combination* of the common level, with a circle divided into minutes; a screw is attached to one of the Y's, as in the old English levels, by which the telescope may be so inclined as to obtain points of curve on a sloping surface, without throwing the di-

vided circle out of a horizontal position; a compass is so applied, as to be attached and detached at pleasure.

Mr. Campbell's object in requesting a notice of his level, is merely to prevent any other, to whom the same combination may suggest itself, from patenting the same, and thereby retarding its introduction into common use.

By order of the Committee.

WILLIAM HAMILTON, *Actuary.*

Aug. 14*th*, 1834.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, Goodspeed & Wiswell's patent "Circular, Vertical, and Angular Sawing and Boring Machine," REPORT:—

That the machine under consideration is a species of saw mill, in which, instead of placing the saw or saws upon cross heads, between two bars or rods acting as stretchers, there is a single support for the cross heads in the middle of the movable frame, and the saws are placed near the extremities of the cross heads, by which arrangement, the saws are left free to operate on planks or boards of any required length or breadth; the central or main support of the saws is sustained by flanges in its upright position, and other convenient flanches receive the cross heads above mentioned.

To use the saws above described for cutting circular segments out of plank, either at right angles to its face, as in the case of the rims of carriage wheels, or at any obliquity, as in that of chair backs, the inventors have employed a quadrant, capable of being adjusted to any required radius, and of lying either horizontal or inclined, according as the rectangular or the oblique section is to be made in the plank. This quadrant is, by means of several separate centres, capable of producing circles of a great variety of radii.

By means of a graduated index and a circular saw, another part of the machine is made to perform the operation of angular sawing, so as to cut from the ends of the felloes of carriage wheels, the requisite sections, in order that they may precisely complete a circle, when the required number is brought into the due position. This graduated index, like the quadrant before mentioned, is adapted to different radii, and to different numbers of felloes to a wheel. The hubs of wheels are bored by another part of the same machine, in which there is a sliding support for the hub, which, for this purpose, is made to rest on an arbor supported by journals, and is then sent forward to be presented to the auger, moving always through the same distance for the same hub, and, of course, boring every hole of the same depth. The auger is placed in supports, which rise and fall at pleasure, in order to "enable the operator to bore at any distance from the table or plane he chooses."

The inventors particularly claim the application of the method of hanging the vertical saws, and the mode of raising and depressing the augers.

The committee have witnessed the performance of a machine of the usual size, and of the above description, and can testify to the celerity and precision with which the constituent parts of a wheel rim are taken from the plank, the ends cut off, the holes bored for the tenons, and the whole thus made ready for being driven upon the spokes. An advantage of no small moment results from the use of this machine, in the saving of material—it being customary, in many establishments, to cut up into chips all those parts of the plank, which the curved form of the felloes does not allow the axe and adze to separate in a more convenient or useful shape.

The committee cannot doubt that wheelwrights, chair makers, and others, who have occasion for the operations of circular or angular sawing, would find this machine an important auxiliary in their respective trades.

By order of the committee.

William Hamilton, *Actuary.*

Aug. 14*th*, 1834.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MAY, 1834.

With Remarks and Exemplifications, by the Editor.

1. For *Softening Sheep Skins, and removing the Fleece;* Jonathan Mann, Amesbury, Essex county, Massachusetts, May 1.

Any required quantity of water is to be heated blood warm, and potash, to the amount of six pounds for every hundred skins, is to be dissolved in it. The skins, if dried, are to be soaked in this liquor for three or four days, a shorter period sufficing if they are green. When taken from the liquor, and well washed, they are ready for pulling.

The old process, it is said, consisted in soaking the skins in water for from three to six days; then beaming, working, and scraping them; soaking them again for three or four days, then beaming, draining, and working; covering the flesh side with paste of slacked lime, packing and piling them together, for two or three days, and then washing, draining, and pulling them.

At p. 339, there is an account of a patent for removing fur from skins, in which process, potash is employed. We have turned to one account only of the processes previously followed, and that is under the article Maroquin, in the *Dictionnaire Technologique*, where, speaking of the objections to the use of lime, it is observed that, to lessen them, "many manufacturers diminish its quantity, and substitute for it wood ashes, or common potash."

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2. For a *Clamp for Sewing and Stitching Harness;* Joseph Burrington, Burke, Caledonia county, Vermont, May 1.

(See specification.)

3. For *Fire Places for Cooking, and Warming Buildings;* James Cox, city of Philadelphia, May 2.

(See specification.)

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4. For a *Canal Steamboat;* Daniel W. Croker, city of Philadelphia, May 3.

In order to confine the boat within a proper width, and to prevent the washing of the banks, the paddle wheels are to be placed one on each side of the stern port, in the after part of the boat, recesses being left for that purpose; this, it is said, will accomplish the first named object. The second is to be attained by giving the buckets of each wheel such an inclination as will cause the water to flow inwards, towards the keel of the boat.

The points claimed, are the making recesses for the wheels near to the stern of the boat, thus saving much room; and placing the paddles, or buckets, at such an angle as to throw the waves inside, thus preventing injury to the sides of the canal.

The situation chosen for the paddle wheels, we think one of the worst in the whole boat, and we apprehend that the employment of oblique paddles, for throwing the water inward towards the keel, will produce little advantage; but little difference will be thereby produced in the swell, that being caused by the displacing of water by the boat, and its flowing in behind as it advances. If a boat is drawn by horses, the swell still takes place; and as regards the agitation produced by paddles, we think the twin boats, so frequently used, with a paddle wheel between them, much better calculated to produce this effect; it will not, however, promote the object of making the boat narrow.

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5. For a *Machine intended to put into operation a New Principle in Hydraulics;* Thomas Hutchings, Reading, Berks county, Pennsylvania, May 7.

Albeit we have paid some attention to hydraulics, and have read with much attention the description of this new machine, intended to operate upon a new principle, we have been altogether unable to keep pace with the patentee in his developments. This is the more to our discredit, as the drawing which accompanies the specification is sufficiently well executed to make its intention known to any one capable of comprehending it; and it also has the requisite references to its different parts. The machine, it is true, very much resembles some of those which are intended to move forever, and to set at nought the inertia of matter, and the effects of friction; and, perhaps, our present obtuseness of perception may result from the entire incapacity, under which we have always laboured, of perceiving how any one of this whole class was to operate.

We are not quite sure that we shall be able to give a clear general idea of the manner in which this machine is intended to be constructed; and as to its mode of operation, we have already said

enough to forbid any expectation of our attempting an explanation of that.

The power of the machine is to be derived from balls of wood, or of some other substance which will float in water. At the lower part of it, there is to be a receiver, or vessel, which is to be kept filled with water. This vessel is represented as a vertical cylinder, from the centre of which rises a tube, or conductor, also filled with water, and through which the balls of wood are to rise to such a height as to be delivered into buckets on the vertex of a vertical power wheel. Within the receiver, or vessel, below the conductor, there are placed two cylindrical rollers, which revolve with their peripheries in contact, being carried by a band on the axis of one of them, which passes through the receiver. These cylinders are to be stuffed with some yielding material, that they may press together, so as to prevent the water passing between them, whilst, by their yielding, they are to allow the balls of wood to pass. The vertical wheel, of which we have spoken, is surrounded by buckets, or pockets, into which the wooden balls are to fall; in the drawing, these buckets are sixteen in number. Now, if the eight buckets on one side have balls in them, the wheel will tend to descend by their weight; each ball is, in turn, to fall out as it arrives at the bottom, and to run through a tube into the receiver, where, passing between the elastic revolving cylinders, into which it is to imbed itself, it rises by its levity through the tube, denominated a conductor, and is delivered, by a spout, on to the vertex of the wheel. There are contrivances to supply the water lost by evaporation, or by leakage; and the main wheel, by the weight of the wooden balls, is to give motion to the collateral parts of the machinery, and to perform whatever labour may be assigned to it.

We are inclined to recommend to the inventor of this machine, in order to insure its operation, the appending to it of some one of the many patented "horse powers," as, without an addition of this kind, it will assuredly remain at a stand still.

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6. For an *Apparatus for the relief of Procidentia, Prolapsus Uteri, &c.;* Amos G. Hull, M. D., city of New York, May 7.

The Doctor states that he has discovered a new fact in surgery, namely, that a prolapsus of the womb, or other organ of the pelvis, can be relieved, or cured, by pressure made upon the belly. The instrument used by him, is in the general form of a truss for hernia, but the front pad is made much larger, and so as to press centrically upon the region to which it is applied. The description given is very full and distinct, and the instrument is well represented in the drawing. The claim made is to the apparatus, founded upon "the discovery of the fact, that properly directed pressure made upon, or against, the lower part of the belly, relieves, and often effectually removes, the falling of the womb, and many other maladies frequently connected therewith."

None but medical men are aware of the amount of suffering which

would be prevented, should the facts be as stated by Dr. Hull; and, in that case every friend of humanity would rejoice to learn that his remuneration was commensurate with the benefits conferred.

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7. For *Preventing Explosions in Steam Boilers;* Cadwallader Evans, Engineer, city of Philadelphia, May 8.

This patent is taken for "an improvement in the mode of applying the fusible alloy as a guard against explosions of steam engine, and other boilers."

Those acquainted with the various devices which have been proposed, and adopted, for the prevention of explosions, know that a fusible alloy, which shall melt by the temperature of the water, or steam, before it rises so high as to be dangerous, has been applied in various ways, and that in France its employment is legally enforced. As hitherto employed, it is liable to several objections, among which is the alteration which the alloy itself undergoes, by fusion in contact with atmospheric air; becoming thereby, to a certain extent, oxidized, and, consequently, having its fusing point changed. Another objection has arisen from the fusion of these disks giving a vent to the steam, through an aperture which could not be closed until the contents of the boiler had become cooled; a circumstance not only attended with delay, but sometimes pregnant with real danger, as the boat, deprived of the action of the engine, may be actually driven on shore. Both these sources of danger are guarded against by the invention of Mr. Evans, in a way which promises to be perfectly effectual, and some idea of which may be collected from the following claim:

"I have thus described two modes in which I intend to carry my improvement in the mode of applying a fusible alloy into effect, which improvement, I do hereby declare, consists in the employment of an air tight tube, or vessel, to contain the alloy, by which it will be preserved from oxidation, or water, for a great length of time, and in which it can be used many times in succession for indicating a certain elevation of temperature, without the necessity of renewing it; avoiding thereby the inconvenience and danger incident to the modes heretofore practised in the employment of it. I therefore claim the using of such alloy in the manner, or upon the principle, herein set forth, whether the same be effected by means of an instrument constructed exactly in the form described, or in any other in which a similar effect is produced by analogous means."

The alloy, when in the solid state, sustains a weighted arm, by enclosing, and holding, a piece of metal attached to the end of a journal, which passes through the box; but when the metal fuses, the weighted arm, which is on the outside of the box, descends, and, in doing so, gives notice, by opening a valve for the escape of steam.

The different modifications of this contrivance cannot be fully understood without reference to the drawings, which are perfectly descriptive.

8. For an improvement in the *Grist or Flouring Mill;* Isaac Straub, Northumberland county, Pennsylvania, May 9.

A hammer, or knocker, is to be so fastened by a joint at one of its ends, to a mill spindle, or other moving part of a grist mill, that whenever the speed of the moving part is increased, the loose end of the hammer, or knocker, will rise, by its increased centrifugal force, and stand at such height as shall be proportioned to its velocity. At a certain point within the range of its rise, a permanent latch, or trigger, is to be fixed, which will be struck, and let off, by the revolutions of the hammer, or knocker. This trigger, or latch, is to be properly connected, by means of levers, or otherwise, to the water gate; "a description of which cannot be given, as mills are so very dissimilar in themselves, that this connexion must necessarily vary, to suit other things, in different mills." The claim is to "the hammer, or knocker, or bolts, or shafts, fixed in any manner to the movements of a grist or flouring mill, calculated to take effect from increase of rotary speed, or motion."

A description like the foregoing, if description it can be called, does not by any means fulfil the requirements of the patent law. The patentee may have a very clear idea of the means of carrying his contrivance into effect, but his business is to convey this idea clearly to others. From the variety of mills he ought to have selected one, at least, and have fully exemplified in this, his mode of procedure; instead of which, his patent seems to be taken for an abstract principle, in which case it cannot be sustained in law. The drawing would lend little, or no, aid to the workman, in his attempt to carry the principle into practical operation.

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9. For a machine for *Kneading Dough for Making Bread;* Noah Wyeth, Hingham, Plymouth county, New Hampshire, May 12.

The dough is to be placed upon a movable platform, which is made to traverse backward and forward by means of a double rack and pinions operating beneath it. A stamper working upon a pin at one end, and being raised and depressed at the other by the action of a toggle joint, works up and down upon the dough as it passes under it. The power applied to produce the necessary motion, whether that of a horse, or any other, is communicated to the toggle joint by means of a pitman, or shackle bar, acting horizontally, and receiving its traversing motion from a crank on a vertical shaft. A rod from the rising end of the stamper serves to convey the necessary movement to the platform, in a way which need not be described. The claim is to "the application of the toggle joint to the stamper, and to the combination of machinery for moving the platform."

This we believe is as much as could be fairly claimed, and it amounts to little or nothing, as the same kind of movement may be equally well obtained by combinations very different from those described in the patent, and not in the slightest degree interfering with them.

10. For a *Corn Sheller and Grinder;* Samuel Slater, and Stephens Noblet, city of Philadelphia, May 12.

The two parts of which this machine consists are, confessedly, both old, the claim being made to the using the axis of the vertical cast iron plate, which forms the sheller, as a machine for breaking or grinding the corn; giving to it, for this purpose, the shape of a grooved, or other cylinder, with an adjustable concave. The machine can thus be used, alternately, for either purpose. It is expressly said, that "the part claimed as an invention, or discovery, is the union of the sheller and grinder in one machine." The amount of invention in this case is certainly very small, and we are apprehensive, too, that it is not of that kind which the law will recognise. If I take a horse power invented by one man, and a thrashing machine invented by another, and merely gear them together, it is much to be doubted whether, in the eye of the law, I should be viewed as an inventor.

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11. For *Machinery for pumping, raising, and conveying Water, and for propelling all other kinds of Machinery whatever;* David G. Colburn, Cayuga county, New York, May 12.

The title of this patent excited some apprehension that the hydraulic apparatus, the construction of which it is intended to secure, was such as the inventor might very safely use, without the fear of competition, although he had not obtained the sanction of an exclusive right; and an examination of the description and drawing has more than confirmed this impression; for, although this patent is not taken for a perpetual motion, it is obtained for a thing which will demand twice as much power to wind it up, as it will ever give back again. A more direct misapplication of mechanical principles has, in fact, been very rarely devised.

There is to be a cylinder fixed upon a horizontal shaft, around which cylinder is to be wound a rope, or chain, with a weight hanging thereto, serving, by its descent, for the power which is to work the pump, and raise the water. At one end of this cylinder there is a ratchet wheel, to hold it as it is wound up; and attached to the same shaft is a cog wheel, which may be six feet in diameter. This cog wheel is to drive a pinion of six inches in diameter, fixed upon another horizontal shaft, upon which also is a wheel of four feet in diameter, the periphery of which is to be scalloped, or waved, for the purpose of giving motion to the pump handle. The pump handle is a lever, or beam, working on a pin at its centre, like a scale beam; and a fork descending from the middle of this beam, embraces the scallop edge of the before-named wheel, which, if it turns round, will cause the beam to vibrate as many times as there are scallops, or waves, on the wheel. To one end of this lever beam the pump rod is attached, and the other is to be notched like the arm of a steelyard, and to have a weight hung upon it to *weigh the quantity of water to be raised;* "this being a very essential part of the operation." The depth to which the weight must descend, in order to keep this apparatus at work for twenty-four hours, may, we are told, be about fifteen feet.

"My claim is for the adapting this combination of machinery to the uses above specified, viz: pumping, raising, and conveying water, and for propelling all other kinds of machinery whatever."

We assure the reader that we are not a somnambulist, but are actually wide awake, and have given the views and intentions of the patentee as fully, clearly, and exactly, as it is in our power to do in the same number of words.

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12. For a *Machine for Shearing Woollen Cloth;* Reuben Daniel, Woodstock, Windsor county, Vermont, May 13.

The specification of this machine commences by stating the things claimed by the patentee, which are the following:

"First. I claim as my invention, the method of constructing the ledger blade, and the revolving cylinder, or bar, to which the twisted cutting blades are attached, of such a proper degree of stiffness as to permit of their being ground together with emery, or other hard pulverized substance, and oil.

"Secondly. I claim as my invention, the method of grinding the ledger blade, and the revolving cylinder containing the twisted cutting blades, by the use of emery, or other hard pulverized substance, and oil, as applied to the revolving cylinder in rapid motion.

"Thirdly. I claim as my invention, the method of making the hollow cylinder to receive the twisted or cutting blades, and the application of this hollow cylinder to the purpose of receiving the blades, for the constructing of shearing machines."

To make the ledger blade of the required stiffness, there is to be a cast iron frame of great strength, and, of course, of such length and width as may be necessary, according to the size of the cylinder to be used. The cutting portion of the under, or ledger, blade, of plate steel, is to be riveted to a stiff cast iron support, of the length of the frame, in such a way as to admit of its being adjusted to the revolving cylinder. The ledger blade is not to be perfectly unyielding, although it is to be stiffer than it has heretofore been used.

The cylinder for a narrow machine, of about three feet, may be a solid iron bar, of two inches in diameter. For a wider machine, it may be made of sheet tin, copper, or other metal, and be from three to five and a half inches in diameter, and furnished with a suitable number of blades.

The method of grinding the ledger blade, and those on the revolving cylinder, is this: after making them as true as possible in any of the ordinary ways of grinding, they are to be put into their places in the machine, with adjusting screws to bring the ledger blade against the cylinder; a rapid motion is then to be given to the latter, which motion must be continued until they are perfectly fitted to each other; emery, or other suitable substance, being used in the grinding.

Whether the foregoing modes of procedure are perfectly new, or to what extent they are so, we leave to the experience of those in the habit of using, and keeping in order, the kind of shearing machine to which they refer.

13. For *Machinery for making Wrought Nails;* Reuben Daniels, Woodstock, Windsor county, Vermont, May 13.

The claims in this machine are, "1st. The apparatus and principle of cutting off the nail rod as it comes hot from the fire.

"2d. The application of Stephen J. Gold's patent dies for making wrought nails, as applied to a reciprocating, instead of a rotary, motion.

"3d. The heading apparatus, as effected by means of a cam attached to the driving or balance pulley.

"4th. The method of constructing and hanging the cylinders to which the dies are attached.

"5th. The method of altering the length of the pitman."

We do not think it necessary to compare this machine as described, with those for making wrought nails which have preceded it, and of which there is a considerable number, although, we believe, not more than one or two of them are now in use. Should this be more fortunate, and make good wrought nails with sufficient rapidity, it will afford prima facie evidence that there is enough of originality in it to entitle it to the protection of a patent.

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14. For an *Auger twisting Machine;* Oliver Snow, Meriden, New Haven county, Connecticut, May 13.

This machine is constructed very much like some of those made for cutting screws upon bolts, in which the bolt is held by a suitable clamp, and turned by a wrench in its passage through the cutting dies. A mould is made, which consists of two parts, hinged together at one end, and having a contrivance by which these parts are held firmly together when closed. This takes the place of the dies in screw cutting machines. When the mould is closed, two semi-cylindrical grooves, one in each half, combine to form a cylindrical opening, having a spiral thread sunk in them, to receive the two flattened edges of the metal, which is to form the twisted part of the auger. There is a clamp to receive the shank of the auger, and this clamp has a cylindrical shaft behind it, upon which is cut a thread, or spiral, corresponding with the twist to be given to the auger, and working through a nut which causes it to advance and retreat with the requisite speed, when turned by the handle, or winch.

"The most important parts of the machine are the die, or mould, and the spiral screw, and the adaptation of the die and spiral screw to each other. I therefore claim as my invention, the construction and use of the die, or mould, for twisting an auger, or bit, of any size, as above described; to the residue of the machine, I make no claim."

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15. For a *Machine for Boring out the Hubs of Wheels,* and the opening for the boxes and lynch cup; John R. Morrison, Springfield, Jefferson county, Ohio, May 13.

A bench is to be made, on the centre of which, one end of the hub to be bored is placed, concentric circles being made as guides

in so doing. A cast iron frame is placed on the upper end of the hub, and is confined there by bolts which reach down to the bench, the frame being so placed as to stand with its centre exactly over that of the hub; a vertical shaft, running in suitable collars, receives at its lower end, bits, or cutters, of any desired size; this shaft is turned by a handle, or cross bar, at top. The hub may be bored half way through, and then reversed, and cutters of the proper size for the boxes, &c., may be used to enlarge the holes; the claim made is to the whole machine. The patentee is, of course, confined to the particular construction which he has described, and which we have not thought it necessary to give in detail. Such machines may be varied in numerous ways; several patents have been obtained for them under different forms, and twenty persons may yet claim to be inventors of certain special appendages, or modes of construction, which may, or may not, be improvements.

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16. For a *Balance Pendulum;* Hiram Twiss, Meriden, New Haven county, Connecticut, May 13.

After describing the pendulum, the patentee says, "I do not claim as my invention, a balance pendulum, as such; but I claim as my invention and improvement, the mode of suspending the same as above described; whereby, first, the weight is placed on a single bar below the centre of motion, thereby producing a repelling action in the balance. Second, in vibrating on knife edges, or points, whereby the friction is greatly reduced. Third, in constructing it with a regulator, by means of which, the effects of heat and cold on the metal is counteracted, and also by means of which, the spring of the balance pressing on the sides of the sockets of the regulator, assists the recoil of the balance when at the highest point of vibration, and most disposed to remain at rest."

"The balance pendulum above described is calculated for, and I regulate it so as to give, forty-five strokes in a minute; whereas the suspended pendulums in common use usually give ninety. This invention will lead to useful improvements in the construction of all time pieces regulated by the vibrations of a pendulum."

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17. For improvements in the *Construction of Clocks and Time Pieces;* Hiram Twiss, Meriden, New Haven county, Connecticut, May 13.

The improvements described in this specification depend, in a great degree, upon the introduction of the balance pendulum, the time wheels being so altered as to answer to the slower motion of the pendulum; and the patentee says that, "with these alterations in the time wheels, my improved clock will move with much less friction, and with the weight on a single cord not exceeding, and probably less than, half the required weight on a double cord now used in eight day clocks."

The balance pendulum is here again particularly described as in the foregoing patent, together with the mode of constructing the re-

gulator; but we cannot afford the space required for their insertion. Certain improvements are also claimed in the striking part, which also we shall pass over, excepting so much of them as may be indicated by the claims, which are the following:

"I do not claim a balance pendulum, as such, to be my invention; but I do claim as my invention and improvement, the successful and advantageous application of the slow motion of the balance pendulum to the movements of any portable wooden clock, or timepiece.

"I do claim as my original invention, the regulator as above specified; whereby the motion of the pendulum is controlled by a spring, and its expansion and contraction counteracted.

"I also claim as my invention and improvement, the construction of the striking part as above specified, whereby the fly is made to revolve backward and forward by means of the lever on the verge shaft, and its connexion with the fly as above specified; thereby checking and controlling the hammer more perfectly, and with less loss of power, than can be done by a continued revolution of the fly as in common use, and so requiring less weight, and less space for the descent."

We do not perceive the necessity for two patents for the foregoing improvements, as the whole appertains to the same instrument, a time piece, and the first, the balance pendulum, is specially mentioned as applied in the second patent.

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18. For an improvement in the machinery for *Breaking, Fleshing, and Unhairing Hides*; Johnson Dunaway, Woodville, Rappahannock county, Virginia, May 13.

The description of the machine here patented is very obscure, and the drawing, though a well executed perspective, does not serve to show its construction and operation with sufficient clearness; possibly, by making a study of it, we might unravel it, but for this we lack both time and inclination. The claim is to the whole machine.

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19. For a *Churn;* James Guston, New Petersburgh, Highland county, Ohio, May 14.

A rectangular box, or trough, is to be made, and two wheels, with dashers, or buckets, like those of paddle wheels, are to cross this box from side to side; they must run clear of each other, and of the bottom and sides of the box; one gudgeon of each wheel is to pass through one side of the box, and to be connected together by means of whirls, and a band; so that on turning one of them by a crank, they will both be set in motion, and the churning effected.

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20. For a *Thrashing Machine;* Amos Parker, Portland, Cumberland county, Maine, May 14.

All that we learn from the specification and drawing of this patent is, that a horse power, consisting of an inclined floor with iron trucks, or wheels, running upon ways, is to be geared to a machine for

thrashing grain, this latter having iron teeth, and a suitable concave.

We are led to the conclusion that the horse power and the thrashing machine are two machines, and, therefore, if they were new, that they would require separate patents to secure them; but as they are both old, and such machines have been frequently combined together, we know not upon what pretence the patent was obtained.

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21. For *Stoves and Grates for Warming Rooms;* William Mix, Prospect, New Haven county, Connecticut, May 14.

Although the particular arrangement of the parts of this stove which form the subject of this patent, is intended to be varied so as to adapt them to grates, &c., we shall present them under that which is first described in the specification, and which, we presume, is that which the patentee intends generally to adopt. A cylindrical stove is to be made in the usual form, and within this is placed a second cylinder, constituting the furnace, or fire place. This second cylinder may be about one-half the diameter of the outer one, so as to leave a space between them, and it may be about half its height. Above the inner cylinder is to be a lining of fire brick. A pipe ascends from the centre of the top of the stove, and at the height of a foot, or so, it enlarges into a drum of about a foot in diameter. Between the body of this stove and the drum, there is a valve, or damper, by which the draft may be entirely averted. From the upper side of the drum, a pipe proceeds into the chimney; the door for feeding the fire, and that into the ash pit, are situated as usual. The distinguishing feature is now to be described, and this consists in pipes which connect the drum with the ash pit, or chamber, below the fire. Two pipes may pass out from the drum, horizontally, and then turn down vertically, parallel to the body of the stove, descending until they arrive opposite to the ash pit, or to a chamber below the fire; they then bend at right angles, and enter into this chamber.

When the valve between the stove and the drum is open, the draft will be upwards, as in ordinary stoves; but when this valve is closed, and air is admitted above the fire, the draft will be downwards, through the burning fuel, up the side pipes, and into the drum above the valve.

The claim is to "the machinery and apparatus above described, causing the reverberation of the fumes through the chamber around the furnace, and the great discharge of heat below the combustion in the furnace, by means thereof."

The stove patented by Mr. Atwood, of New Haven, (see No. 29 for last month,) although differing from this, bears so strong a resemblance to it, as to give the idea of some near relationship between them.

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22. For a *Rotary Stove;* Elisha Town, Montpelier, Washington county, Vermont, May 15.

A fire place proportioned to the size of the stove, is to have an

oven situated behind it, with a draft above and below the said oven, for the heated air. There is to be a circular projection on each side of the plate which covers the oven, and a part of the fuel room; and upon the upper side, and near to the edge, of this plate, a circular rim is to rise sufficiently high to allow a portion of the heated air to pass to the flue, over the oven, and also allow room for the bottoms of the boilers, &c., which fit into openings in the top plate, to pass over the oven. A large circular plate is placed over the fuel room. The patentee says that, "For the above described plates, I do not desire to claim them as a part of my invention."

Above the said circular rim, and resting upon it, is a circular rotary plate, which projects a little beyond it, and may revolve on a centre pivot projecting down through the bottom plate. This plate has openings in it for boilers, and may be turned by means of a lever adapted to the purpose.

"The principle for which I claim the invention, and for which I would ask letters patent of the United States, is the revolving top plate or fixture, into or on which are placed the principal utensils used in cooking, and for other purposes to which the stove may be applied."

The taking of this patent is altogether a strange affair, as the foregoing claim is in the precise words used by Henry Stanley, of Vermont, who obtained a patent for a cooking stove on the 17th of December, 1832; see vol. xi. p. 381. That stove has a rotary top, and contains what the present patentee does "not desire to claim;" yet he has desired to claim, or has claimed contrary to his own desires, the same things in the same words used by Mr. Stanley. A patent for another cooking stove was obtained by Mr. Town on the 16th of December, 1833, one year after Stanley's; but in this he says nothing about a rotary top plate; see vol. xiii. p. 390.

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23. For *Water Wheels for driving Mills;* Benjamin Dugdale, city of Trenton, New Jersey, May 15.

This is to be a horizontal wheel with hinged buckets, acted upon by the tide, or the current of a river. The buckets are to be checked by a chain, or otherwise, so that they may close in one direction, and not open too far in the other. This poor contrivance has been tortured into many forms, but under the whole of them it has been perversely disposed, disappointing the fond hopes of its progenitors. Much is expected from this last born of the family, as we are told that "This water wheel may be applied to many purposes; amongst which is that of raising great weights, and also for raising vessels that are sunk, &c. &c., for which purpose it may be secured between two vessels of sufficient size to sustain the weight to be raised, and the power multiplied by cog wheels, or a system of wheels, or by screw and cog wheels geared to said water wheel, or the shaft thereof." These are floating ideas, which, as waking dreams, may be entertained without much cost; but which, if attempted to be reduced to practice, would arouse the projector to a knowledge of unwelcome realities.

24. For an improvement in the *Stop Motion of the Drawing Frames used in Cotton Spinning;* Lewis Cutting, Lowell, Middlesex county, Massachusetts, May 15.

Instead of that arrangement in the ordinary drawing frame, by which the latch operates in throwing the driving belt on to a loose pulley when the lap leaves the conductor, by breaking or running out, a straight steel spring is substituted for the latch, and this is notched at one end, so as to hold in a corresponding notch made in the end of the rod to which the spiral spring is attached, and connecting the straight spring with the revolving rod; so that, when it has let the rod and spiral spring at liberty, the spring, by its backward motion, acting on the revolving rod, and that on the foot of the wire which supports the conductor, will cause the latter to resume its upright position; thus saving the time which, in the old mode, is required to replace it by hand. The claim is to "the application of a spring to operate on the conductor as above described, or as may be found most convenient to cause it to resume its upright position, after it has thrown the frame out of gear."

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25. For a *Double Power Mill, or Machine;* Luther Copeley, New Lebanon, Columbia county, New York, May 15.

This contrivance, the petition informs us, is made by one of the people called Shakers, a people who are in the habit of making many good things, but who, like those of other sects, are also capable, as it plainly appears, of making mistakes; and we think, in more senses than one, sometimes cheat, or attempt to cheat, nature out of her dues, notwithstanding their proverbial honesty. We have before us one example of this, "in the construction of a mill or machine wheel, and the application of water, wind, or steam, thereto, as the propelling power, by which *the same power is used twice*, and a double power obtained."

We shall not attempt to give the construction of this machine in detail, but only explain the principle upon which it is to violate all principle, by generating double power. There is to be a horizontal wheel which is to have floats, or buckets, pendent from its lower side. The shaft of this wheel is to be double, the outer part forming a tube within which the inner shaft is contained, so that they are capable of revolving in reversed directions. The water, wind, or steam, is to be passed through the step, or lower gudgeon, which is hollow, into a space between the hollow and the tubular shaft; and from the latter, it is to pass through a trunk, or tube, at right angles to it, and from which it issues upon the floats of the wheel, escaping laterally; so that this hollow trunk shall operate like that of Barker's mill, whilst the water, &c. issuing from it, propels the float wheel in the opposite direction. We have not time to attend to those who do not know enough of mechanics to see the fallacy of this contrivance. Something like it, *in principle*, may be found at p. 250, No. 64.

26. For a *Cultivating and Tilling Machine;* Joseph D. Prescott, Chesterville, Kennebec county, Maine, May 15.

This is the common, triangular harrow, or cultivator, with three irons in it; the front one operating like a double mould board, in opening a furrow; and the two back ones, called furrowers, being made to shift, or twist round, so that they may throw the earth in towards the centre, or out from it, as may be desired. "A patent is claimed on the furrowers only, which may be changed from right to left, as above; also directly forward of the furrowers, cutters may be set to use at will, as the soil may require."

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27. For a *Fender for protecting the Bows of Vessels;* William Johnson, Louisville, Jefferson county, Kentucky, May 15.

Two casings are to be made to the bows of the vessel, one of which is to be firmly fixed to the vessel itself, and the other, or outer one, is to stand at a suitable distance from it; between these two casings, are to be placed spiral steel springs, forcing them apart, but capable of yielding when the outer casing strikes against any resisting article. Check chains are to be used, to keep the outer at a proper distance from the inner casing; and bolts attached to the former, are to slide into holes in the vessel's bows, to guide it correctly. The claim is to the whole apparatus.

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28. For *Manufacturing Napped Hats;* Lemuel Lyon, 2d, Needham, Norfolk county, Massachusetts, May 15.

The waste material known amongst hatters under the names of "podgum," "strikers," or "skimmings of the kettle," which consists of fibres of cotton, hair, and fur, and has heretofore been thrown away as useless, the patentee preserves, dries, and works in with wool, so as to make a component part of the bodies of hats to be napped. The claim is to "the converting to use, as above described, this *podgum, striker, or skimmings of the kettle.*"

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29. For an improvement in the *Loom for Weaving Carpets, and other figured Cloths;* John Haight, Harsimus, Bergen county, New Jersey, May 17.

We cannot pretend to epitomize this specification, which is of great length, and refers to the drawings; but a general idea of the improvements which it describes, may be obtained from the following claim:

"I claim specifically as my invention, the polygon for holding and changing the shuttles; the double shuttle boxes, and manner of changing them to the slay, and the application of the cam to raise the uprights and work the engine; and the general arrangement and combination of machinery by which the several movements are effected."

30. For *Water Proof Boots and Shoes, from India Rubber Leather, or India Rubber Cloth;* Edwin M. Chaffee, Roxbury, Norfolk county, Massachusetts, May 17.

(See specification, at p. 341.)

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31. For a *Press for Cotton*, and other Substances; Robert Triplett, Daviess county, Kentucky, May 19.

The power in this machine is applied by means of an iron screw placed horizontally, and having on each of its ends a follower, which followers are alternately forced up against the article to be pressed. The screw is made to traverse backward and forward by means of an iron cog wheel, which operates as a nut, having a female screw through its centre, which fits on to the horizontal screw; a crown wheel upon a vertical shaft, gears into the teeth of the nut, or cog wheel, to give it motion, and as this nut turns between stationary collars, the screw traverses, without turning. The vertical shaft may be turned by horse, or other power. The collars, or bearings of the respective parts, we need not describe, as any competent workman will readily understand how to adapt them to the other parts. The boxes, and other provisions for forming the bales, may be similar to those generally used in cotton presses.

It is intended, sometimes, to make the cog wheel fast upon the shaft of the iron screw, so that the latter may revolve without traversing backward and forward; in this case, the screw works in a nut fitted to a frame, or bale, attached to each follower, in such a manner as to allow the requisite room for the traversing of the screw between the nut and the follower.

This modification of the machine, as well as its general construction, is distinctly described and claimed, and we think that there is sufficient novelty in the general arrangement, as claimed, to sustain the right of the patentee.

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32. For a *Machine for rolling and cutting Crackers and Biscuit*; Daniel Poole, Dauphin county, Pennsylvania. First patented December 24th, 1824. Patent surrendered, and reissued upon an amended specification, May 20.

In the original specification, the parts were particularly described, but nothing claimed, which omission is supplied in the new specification. The general construction of the machine is as follows. There is a bench of sufficient length to sustain the apparatus, say six feet, its width depending upon the number of cutters to be employed. The dough is placed upon an endless feeding apron, by which it is carried to rollers, in passing between which it is brought to the proper thickness. From them, it passes under a row of tubular cutters, which are worked up and down by means of a crank. These cutters are furnished with prickers, and with a clearer, by which, as they rise, the cracker is forced out of them. The bed upon which they are to be cut, is made of lead, and the whole cutting apparatus is

inclined at an angle of about fifteen degrees from the perpendicular; this, we suppose, is to cause the crackers, when cut, to slide on to a second endless apron, upon which they are carried from the machine.

The claims are to the rolling of the dough between the rollers, without any intervening material to roll it on, and to the joint operation of rolling and cutting as described.

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33. For a *Steam Boiler;* Levi Burnell, Elyria, Lorain county, Ohio, May 21.

We cannot easily describe the construction of this boiler, without the drawings, but we may afford some general idea of it, which is as much as we think necessary, not viewing it as any improvement upon those generally used. The boiler is to be in the form of a vertical cylinder, terminating at top in a cone; in the inside of it there is to be an inverted cone, the bases of the two uniting at the top of the cylindrical part of the boiler, which is to be the water line. There is to be any desired number of cylindrical boilers within the outer case, each of them being formed of two concentric drums, placed an inch or two apart, and united by suitable rims. The furnace is to be a vertical cylinder in the centre of the boilers, and the draft from it is intended to pass alternately up and down, over and under the respective cylindrical boilers, until it arrives at a proper place of exit; the concentric boilers being so placed as to admit of its so doing, whilst they all communicate by tubes with the steam chamber above.

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34. For *Propelling Boats on Canals and Shoal Water;* Levi Burnell, Lorain county, Ohio, May 21.

Wheels with notched, or indented faces, and shod with iron, are to be placed on shafts inclined towards the stern, on either side of the boat, which shafts are capable of rising and falling to suit the inequalities of the bottom on which the wheels are to run. They are to be made to revolve by proper gearing connected with a motive power in the boat.

By searching among the American patents, we could find one for an apparatus similar to the foregoing, but do not think it necessary, as we can go much further back, and probably even to the origin of this invention, as it dates at a period of upwards of a century back. Among the different machines described in the volumes of the "*Machines approuvée par L'Academie Royal*," there is a plate and description of this identical wheel, running upon the bottom of a canal, or river. Were it new, however, it would not answer the intended purpose; and among other objections to it, that of its digging up, and disturbing the bottom, would be one of some consequence.

Those who are curious on the subject, and have the means of reference, may examine the 2d vol. p. 25, of the above named work, where, under date of 1702, they will find the description of a "*Machine pour remonter les Bateaux, inventée par M. Martinot.*" It will then appear that this wheel has a fair claim to be placed among the "Modern Antiques."

35. For a machine for *Breaking and Cleansing Hemp and F ax*; Robert Miller, Glasgow, Barren county, Kentucky, May 23.

We have not examined the list of patents, but presume from the wording of the claim that this is taken for improvements upon a machine previously patented by the same person, as he says, "To my original invention is now added ten improvements, (for which, only, a right is claimed.) 1. Cogs in the form of an inclined plane; 2. Cast iron friction wheels; 3. Iron faced blocks; 4. stuffed head blocks; 5. Guards for the spring poles; 6. Regulators on the brakes; 7. Movable slats and their forms; 8. Finishing brakes of equal swords, both for the machine and hand; 9 Cleaning the offal; 10. Adjusting the triangles."

Whether all these, including friction wheels, movable slats, &c., are new, and patentable, we shall not now stop to inquire; there are others, we presume, who can reply to a question upon the subject.

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26. For an improvement in *Bedsteads;* Robert Miller, Glasgow, Barren county, Kentucky, May 23.

Some pains have been taken with this and the preceding specification, and the drawings accompanying them are pretty well executed; yet they fail in giving a clear idea of the particular things intended to be patented. So far as we are able to judge respecting the bedstead, the rails are to be united to the posts by means of irons dropping into each other, in a manner not very unlike many other bedstead fastenings. The sacking bottom is to be tightened by revolving iron bars, or rods, placed within the rails, and extending their whole length, they having journals turning in proper holes, and ratchet wheels and palls to hold them in their places. The patentee, who ought to know its value, praises the affair very highly; he says that "it is firm to solidity, durable as wood and iron; nor is there a single invisible lodgment for one of those pestiferous vermin that have so long annoyed the human family; it never needs scalding, whence it is called the *Clean*, *Firm*, and *Everlasting Bedstead.* As the sailor said by the *everlasting* to make into trowsers, "in that case, let me have enough for two pair."

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37. For *Bellows for Smiths' Forges,* and other purposes; George Lewis Dimpfel, city of New York. An alien, who has resided two years in the United States; May 23.

The claim annexed to the specification of this patent is in the following words. "And I, the said George Lewis Dimpfel, do hereby declare that I do not mean to claim as my invention, any of the parts of the said bellows taken separately, the same being generally known: But I claim as my invention, the shortening of the rock-staff board near the throat; the adding a second, or short body board, with two additional valves, in such a way that the descent of the weight adds to the quantity and equality of the blast; and the general arrange-

ment and combination of the same, for giving a more equal and effective blast of air, as herein substantially set forth and described."

The arrangement we believe to be new, and well calculated to attain the end proposed.

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38. For a *Machine for Breaking and Working Hides;* Josiah Bonney, Cornwall, Litchfield county, Connecticut, May 24.

The proposed mode of working hides is to put them into a common dash wheel, which is to be fourteen feet in diameter, and the heads two feet and a half apart. The heads are to be entire, with the exception of a space on one side, near the axle, for putting in the hides. Slats are to be placed in three or four places, across the wheel, near to its periphery, in order to lift the hides, and cause them to fall down. The same plan, we are told, may be applied to the fulling of cloth; and "What the inventor would by patent secure to himself is, the process of breaking and working hides, scouring leather, and fulling cloth, by a continuous rolling, beating, or falling, in a wheel, or equivalent machine, as above specified and described."

The wheel happens not to be new, although we do not know that it has ever been used for working hides. As to its being substituted for the fulling machine, no idea could be much more fallacious, the process of fulling requiring the continuous action of those powerful beaters employed for that purpose, or something equivalent thereto.

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39. For a *Compound Rotary Steam Engine and Boiler;* Simon Fairman, Lansingburgh, Rensselaer county, New York, May 24.

The description of this engine is one of great length, and we have read it through with as much care as our attention to an individual specification will allow; still we have obtained but an imperfect idea of the apparatus, as it is very complex; and the drawing, although very well executed, represents it in perspective only, without any of those parts in detail which it is attempted to describe in words. This, in fact, is one of those cases in which references to drawings should have been made throughout the specification.

The engine, as its name indicates, is to be of the rotary kind, but it differs essentially from most of the engines of that class, as it is furnished with cylinders and pistons like those of the reciprocating engine, of which cylinders there may be any convenient number; in the drawing before us, four are represented. The boiler is a vertical cylinder, resembling in its construction, and in the direction given to the draft, that named at p. 403, as patented by Levi Burnell. The boiler is to serve as the foundation of the engine, a hollow cast iron column rising from it, through which the steam is supplied; from this, it enters a hollow, horizontal shaft, around which the cylinders and their pistons, &c., revolve; these cylinders are placed on a hub, to which they are attached by their bottoms, projecting out in a radial direction, like the spokes of a wheel. A piston in each of them is to be acted upon at either end, alternately, and the connect-

ing rod from each piston is so arranged as to cause it to concur in giving a rotary motion to the system of pistons; how this is done we cannot attempt to explain, and on this point in particular the specification is inadequate to its purpose.

The things claimed are "the making the boiler serve as the foundation whereon to set the engine, and thereby saving room; and also the main principles of constructing a steam engine set forth in the foregoing specification."

We venture to predict that this engine will experience the fate of a host of its predecessors of the rotary kind, and prove a source of expense, instead of profit, to its contriver. Considerable ingenuity is manifested in its arrangement, but, if no other objection existed to it, its complexity would suffice to forbid its use.

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40. For a *Machine for Sawing Shingles and Blind Slats;* Isaac Drake, Minot, Cumberland county, Maine, May 24.

The specification of this machine would, of itself, form a small volume, from which we will abstract the claims only.

"The specific and useful improvements hereinbefore described, and claimed by me as the first inventor, are the following: 1st. The mode of moving the carriage by screws. 2d. The mode of reducing friction, and guiding the carriage in its movements by the application of friction rollers. 3d. The particular construction of the dogs, and the mode of applying them to the bolt. 4th. The particular mode of changing the position of the bolt, so as to saw different lengths. 5th. The particular mode of keeping the bolt firmly on the carriage, by means of elevating the dog plate, when the bolt is first applied. 6th. The particular mode of setting for the thickness of the shingles, &c. to be sawed."

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41. For an improved *Condenser for Stills;* James Root, Painesville, Geauga county, Ohio, May 24.

This condenser is to be made by taking two sheets of copper, each fifty-two feet in length, and placing them parallel to each other, and not more than an inch apart; studs are to be soldered between these, to keep them at that distance, and their edges are to be bent over and united by soldering, thus forming them into a flat tube, fourteen inches wide. This tube is to be bent in the middle, so as to reduce it to about half the length, the space between the two parts being four inches at the bend, and eight inches at the ends. One of these ends is to be connected with the still, by a tube, at its lower edge; and from a tube at the upper edge of the other end, the vapour is to escape into the ordinary worm. The condenser is to be placed within a vat supplied with cold water, and is to have an inclination towards the still of half an inch to a foot, throughout its whole length, that the fluid formed in it may return by its own gravity.

By this arrangement, alcohol of a very high proof can, it is said, be obtained in the first running, and that with great economy. The claim is to "the constructing of the worm, or condenser, flat, so that

the sheet of steam passing through it shall not be more than one inch thick, and of sufficient depth to allow the ascending steam of spirit, and the descending condensed water, to pass along the condenser without interfering; and in putting in the studs to prevent the collapsing of the condenser." "It may be made straight, circular, zigzag, &c.; the principle is the same."

This claim cannot, certainly, be sustained, condensers formed of flat tubes having been made, and more than one of them patented.

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42. For an improvement in *Boats;* Rufus Porter, Billerica, Middlesex county, Massachusetts, May 26.

The patentee says that his boat is so formed as to be a pointed spheroid; that it is to be made of staves like a barrel, brought to a point, the staves being secured to round disks of timber, by bolts, spikes, or screws. The proportion of the length, to the diameter, should be as twenty to one. Two of these may be taken, and secured at a proper distance apart; a superstructure is to be erected above them, and a paddle wheel may play between them.

"The point which I claim as original in this invention, is the peculiar shape, or figure, of each single boat, applied as above, whether solid or hollow."

See the specification of Mr. Burden's boat, vol. xiv. p. 195, the form of the floats of which was publicly known, by notices in the newspapers, for many months before the patent was obtained for it.

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43. For *Machinery for Making Combs;* Benjamin and William Redheffer, Germantown, Philadelphia county, Pennsylvania, May 26.

This patent is taken for tools to be employed in the getting out and quilling of horn or tortoiseshell, for combs, preparatory to cutting the teeth. These tools consist of revolving steel cutters, or scrapers, and bearing pieces so constructed as to hold and advance the material properly against the cutters. In those for flat, or plane work, the teeth run straight across from end to end; in those for quilling, there must be grooves on the cutters corresponding to the size of the quill to be formed. The different scrapers are to be made to slide on and off the same axle, so that the quilling tools may be readily changed for those of other sizes.

It is much to be doubted whether a patent for revolving cutters of this description can be sustained, as they have been used in the lathe for a variety of purposes for many years; and the application of such tools to the scraping, or cutting, of horn, &c., for combs, does not render them new. It is necessary, in order to justify the obtaining of a patent, to tell what is new in the thing patented, which has not been attempted in the present instance.

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44. For an improvement in the mode of *Cutting out Shoes;* Charles Weston, Salem, Essex county, Massachusetts, May 27.

Knives are to be made in the various forms required for the leather

of the shoe, and with these, fixed to proper blocks, the upper leathers and soles are to be stamped, or cut out.

How old this contrivance may be, we cannot tell; but this we know, that the same thing was patented here twenty years ago, and again about six years since, and also that it has long been in use in Europe. The present patentee is probably not aware of this, but when the thing was patented six years since, the applicant was informed of it, and the machine exhibited to him; on being told that he could not sustain the patent, he replied, "but I can sell rights."

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45. For *Twin Boats;* Charles Harris, Norfolk, Norfolk county, Virginia, May 27.

"My invention consists of two half boats, connected by beams, knees, braces, and deck above the surface of the water, and placed horizontally parallel, or horizontally inclined towards each other." To give the proper form, a whole boat "would have to be divided from stem to stern in a direct line, centrically, and perpendicularly." "I claim, and here assert as stated in the preamble of this description, to be entirely original, and a before unknown, and unused method of putting machinery into operation." Gently Sir; this world is large and old, and the heads which have contrived, and the hands which have executed, have been numerous; the consequence has been, that they have "found out many inventions," so that "new things under the sun" are very scarce, and be assured that your twin boat is not one of the number.

At p. 412, vol. iii., there is a specification in these words: "The improvement consists of two boats connected by one deck. These boats are to be built with the ordinary curvature outside, but straight throughout on the inside. In the space between these two boats, is the wheel by which it is propelled by ordinary steam machinery placed within the two boats. If necessary, two wheels may be used, by having additional machinery of the same kind" We presume that this example may suffice; if not, we have others at our command.

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46. For an improved *Spindle Grinder;* James Wheaton, Machinist, Providence, Rhode Island, May 28.

In its general construction, this spindle grinder is similar to that now in general use, but the mode of connecting the lathe with the carriage, "is claimed as new, as well as the method of grinding it as it moves on the carriage. From the centre of the carriage, or about the centre, lengthwise, and near the edge of it next the grindstone, a stud, or pivot, extends upwards, which is fast in the carriage, but moves easily in a slot in the lathe. The lathe might be turned entirely round on this, were it not for other parts of the machine; its object is to permit it to be partly turned as it moves on the carriage, and at the same time to give it the same motion forward and backward that the carriage has." Weights are used to keep the carriage regularly against the track, and to aid in keeping the latter steady; the use of these is claimed.

47. For an improvement in the *Machinery for Shearing Broad Cloths;* John Davidson, Springfield, Windsor county, Vermont, May 29.

The whole of this machine is very fully described, references being made to well executed drawings, one-fourth of the size of the actual apparatus. The claim is in the following words:

"Although I have described above the whole machine, embracing my said improvements, yet it is to be distinctly understood that I do not claim the whole of the above described machine as new, or of my own invention. But what I claim as new, and all which I claim as such, is, the construction, use, and application of such ledger blade as aforesaid, with a metallic bed and back, fixed and rendered stiff, firm, and unyielding, attached to a metallic frame, in connexion, as aforesaid, with such rotary cutter as aforesaid, and in combination therewith for the purpose of shearing broad cloths from end to end. The great advantage of the above improved machine for shearing broad cloths, is, that it will shear such cloths as well, and much faster, than the machinery now in common use for that purpose."

It will be seen that this machine is from the same neighbourhood as that described in No. 12 for this month, and they have much the appearance of having sprung from the same seed.

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48. For an improvement in the *Application of the Bellows in Smith's Forges;* Ransom Green, Brunswick, Rensselaer county, New York, May 31.

It is proposed to make the forge in the form of a box, which may be three feet square at top, and of the usual height of a forge, the place for the fire being near one edge of the top of the box. The bellows is to be within the box, and its pipe is to be introduced into an iron cylinder, which may be twenty inches in height, and ten in diameter, which cylinder is directly under, and extends up to, the forge fireplace. At the top of it may be a pan, with grate bars, when a diffused blast is required, or the blast may be led in through a pipe on the side, when a concentrated blast is required, as in the using of bituminous coal and charcoal, for welding, &c.

The claims are to "the manner and principle of using grates for burning coal in forges. The manner and principle of communicating air from the bellows into a cylinder or other cavity, so as to apply it in a diffusive manner. The manner and principle of changing this diffusive application of air to one more concentrated. The manner and principle of placing the bellows within the box of the forge; and also the right of applying any of them to forges now in use."

We have a portable forge in which the bellows is situated like that represented in the drawing of this patent, but not with the cylinder, or cavity; and we have seen forges in which the wind is diffused by passing into a chamber beneath the fire, and then up through a grate.

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49. For a machine for *Gumming Mill and other Saws;* Joshua Draper, Harrisburg, Fayette county, Indiana, May 31.

It is now a considerable length of time since we have encountered

a gumming machine, of which so many were formerly patented, and in which there is so little radical difference, as there must be in all of them a suitable bed piece, and a die to be forced down upon it, the two forming the cutters. In the present instance, the die is to be forced down by an oval cam, at the end of a lever, the requisite appendages being attached. There is no claim made.

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50. For a *Horse Power;* invented by Joel Eastman, late of New Hampshire, deceased. Patented by his administrator, John Martineau, of Eldridge, Onondaga county, New York, May 31.

This is a very ingeniously contrived apparatus, the invention of a gentleman whose talent for mechanics was of no ordinary kind, and who, had he lived, would, probably, have found but few equals in a department in which our citizens may be said to excel. His premature death was a real loss to his country, whilst those estimable moral qualities by which he was distinguished, left a void, not easily filled, in the bosoms of those who knew him intimately.

In this machine there is a stationary wheel placed horizontally on a suitable bed, or frame. This wheel has teeth on its inner rim, pointing towards its centre. The lever by which the horse is to draw, crosses the upper side of this fixed wheel, and has, on its lower side, two (or three) smaller wheels, which drop within, and gear into, the teeth of the fixed wheel, and also into a pinion standing between them, on a shaft in the centre of the fixed wheel. On the lower end of this central shaft there is a crown wheel which gears into, and drives a pinion upon, a horizontal shaft, through which motion is to be given to any machinery.

The claim is to the stationary wheel, combined with the smaller wheels which gear into it, and to the pinion in the centre; "the improvement effected by which arrangement, is the advantage of bringing cogs into action on opposite sides of the journal of the pinion, by means of which the stress is taken off the journal, and two or more cogs being brought into action at the same instant, the stress is divided and distributed; thereby diminishing the liability of breaking the cogs; and, in fact, doubling the strength by this arrangement where the cogs are of the same size, and trebling it if three wheels are used. Another advantage resulting from this arrangement, is compactness and portability. These and all other advantages that are derived from this application of the foregoing described combination, however the same may be modified in practice, is claimed in trust for the heirs and legal representatives of the aforesaid lately deceased Joel Eastman."

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51. For a *Machine for Perfuming Dwellings, and Cleansing them of Insects;* Joseph H. Clark, Connersville, Fayette county, Indiana, May 31.

Although we are not so informed, we presume from the construction of this machine, that it is intended to destroy bed bugs by steam; as it is similar to two instruments for that purpose which have been

patented in the United States, and which had been previously described and figured in the London Mechanics' Magazine, and other European journals. A boiler is to be placed in a sort of chaffing dish, or furnace, and the water it is to be made to boil by means of the coals contained in the furnace. A tube is provided to supply the boiler with water, and another to direct the steam where it may be required. The boiler is to be a cylinder three inches in diameter, and ten long, placed horizontally; and with such a boiler, it will require no small care to prevent the water, instead of steam, from escaping.

Upon examining the specification a second time, it appears that the patentee intended to point out the particular use to which he designed principally to apply his machine, and that our first remark stands in need of correction; at all events the description of it would certainly admit of that construction, as will be seen from the following quotation: "to perfum use berguemont or aney other perfum plesant to the smell use peneroyal and steem beds will cloar them of insects."

We are sometimes able to translate as we read, but at other times we are obliged to read a sentence more than once before we succeed in comprehending it fully, and such was the case with the one last quoted.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for a Clamp for sewing and stitching Harness. Granted to JOSEPH BURRINGTON, *Burke, Caledonia county, Vermont, May* 2, 1834.

To all whom it may concern, be it known, that I, Joseph Burrington, of Burke, in the county of Caledonia, and state of Vermont, have invented an improvement in the manner of constructing the clamp, used in the sewing and stitching of leather for making harness, and for other purposes. And I do hereby declare that the following is a full and exact description thereof.

I make a trestle, or horse, of a little less in height than that ordinarily employed as a seat, when working at such a machine, the actual seat being upon the widened end of a lever, to be presently described, which serves also to close and open the jaws of the clamp. At or near the middle of the top of the trestle, I affix two upright standards, on the upper end of which I attach, by hinges, or rule joints, the jaws of the clamp. The lever, to which I have already alluded, extends along the trestle, from end to end, working upon a pin, or fulcrum, at that end which is furthest from the seat; and having two rods extending up from the middle of it, which are fastened to staples on the under, or inner, side of the jaws; when the end which is widened out so as to form a seat, is pressed upon, the jaws will be firmly closed, and when the pressure is removed, a spring operating upon the under side of the lever, will cause it to rise, and the jaw will open. This spring may be situated on the under side of the

trestle, and connected with the lever by a rod extending up to it, or it may be placed between the lever and the top of the trestle; a counter weight may also be used instead of the spring, but not with equal advantage. A table, or platform, may be fixed at the off-side of the clamp, on which the work, when requisite, may rest; and this will at the same time, serve to prevent its coming in the way of the lever.

What I claim as my invention, is the manner of arranging the apparatus for closing and opening the jaws of the clamp, by means of the seat, and a spring, operating in the manner set forth; without intending hereby to limit myself to the precise form and manner described, but to vary the same in any way which I may find convenient whilst the general principal remains unchanged.

JOSEPH BURRINGTON.

Specification of a patent for a Fireplace for cooking, and for warming apartments. Granted to JAMES COX, *city of Philadelphia, May* 2, 1834.

To all whom it may concern, be it known, that I, James Cox, of the city of Philadelphia, have invented certain improvements in the construction of fireplaces intended for cooking, and for warming the apartments of a building, and I do hereby declare that the following is a full and exact description thereof.

The fireplace which I use is of the open kind, with a grate for burning anthracite coal; in describing this, I will assign dimensions to certain parts thereof, and of its appendages, without, however, intending thereby to confine myself to such dimensions, but to vary the same as convenience or experiment may dictate, whilst I do not deviate from the principles upon which my invention depends. I shall also describe certain parts, and modes of arranging them, which in their individual characters, are not new, and which, when so considered, do not constitute any part of my claim to invention.

Believing that great advantage in the economy of heat, is to be derived from having a large quantity of fuel in a state of slow combustion, instead of a smaller quantity in a state of rapid combustion, when much of the heat must be carried off by the velocity with which the current of air escapes, I construct my grate larger than usual, and make my other arrangements to correspond therewith: and although I adapt my fireplace to the business of cooking, I construct it so that no part of the apparatus intended for that purpose, shall necessarily be permanent, but that this may all be removed, and leave it with the ordinary appearance of a grate in an open fireplace.

The opening for the fireplace may be three feet square: that is to say, three feet from the hearth to the arch, or breast, of the chimney, and three feet from jamb to jamb. The grate may then be eighteen inches long, twelve inches in height from the bottom bars to the top, and nine inches from front to back. The back of the grate is to be of soap-stone, or some similar material; but above the grate, the back and sides may be formed of cast iron plates, placed vertically; the

sides are to form an obtuse angle with the back, so that a line drawn from the centre of the grate in front, to the junction of the back and side plates, would form a right angle, or nearly so, with the latter. The space between the grate and the side plates of the jambs, is to be finished off horizontally, and on a level with the top bar, recesses being thus formed upon which articles to be kept warm are to be placed. Below the grate, I intend, in general, to place bars, or grating, to allow the ashes to fall through into a receptacle in the cellar.

The air which is to be admitted into the room to supply the waste by combustion, passes, in the first instance, through an opening in the wall at the back of the fireplace, where the outside of the wall admits of it; and, if otherwise, it is admitted from the cellar, or through tubes under the floor, from the outside of the house, into a space between the back wall of the chimney, and the soap stone, or fire clay, slab which forms the back of the grate, already mentioned; this slab descending down as low as the hearth, for the purpose of forming this hollow chamber, which is as wide as the back of the grate. The space between the slab and the back wall, at the upper edge of the slab, or the level of the top of the grate, should be about three-fourths of an inch, widening as it descends by the slab, having an inclination forward of about an inch in a foot. The air which is admitted into this space at about the level of the hearth, is heated in its passage up, particularly as it passes behind the cast iron plate behind, and above, the fire. When it arrives at the upper edge of this plate, it is thence delivered into a receptacle placed in the flue of the chimney, where it is more highly heated, in a manner to be now described.

The flue of the chimney I make large, say of the whole width of the fireplace, three feet and nine inches in depth, in order to allow of my placing therein the receptacle, or air heater, above alluded to. This I make of copper, iron, or other suitable metal, of such size that it shall fill up the whole depth of the flue from front to back, and of such width as to allow a space of three or four inches, more or less, on each side of it, for the passage of smoke and heated air from the fire. The air heater may be three or more feet in height, and may extend down to within three or four inches of the arch, or breast of the chimney. The lower end of it is closed, with the exception of that part of it by which the air from the hollow back, before described, is to be admitted into it. I have stated that the upper part of this hollow back is formed by a plate of cast iron placed at a small distance, say three-fourths of an inch, from the brick wall. There is a corresponding opening along the back part of the lower end of the air heater, so formed and fitted, that when it is properly fixed, the whole of the air which rises through the hollow back, will pass into it, without admitting any portion of that which rises from the combustion of the fuel. The air does not enter immediately into the body of the heater, but passes along a cavity formed by making the bottom and sides of it double, to within a few inches of the top, by which it is compelled to pass up along the sides, and is thereby ex-

posed to the heating influence of the air from the burning fuel. By this arrangement a large portion of the heat which, under ordinary circumstances, escapes up the chimney, is communicated to the air within the heater; and a tube from this, passing through the front of the chimney into the room, will warm the room, and supply what air is necessary for the draft of the fire. Tubes may also be employed to conduct the warm air from it into other apartments.

The heat may be still further economised by having hollow ends, as as well as a hollow back, to the grate and fireplace, into which cold air is to be admitted from without, whence it may supply the draft through holes made for the purpose, below the grate. This, however, I am aware, has been previously done.

Valves, or dampers, are to be employed to close any of the openings when it is necessary so to do, to regulate the quantity, and direct the course of the air which is to pass through them.

For the purpose of baking, I construct a portable oven which is to be set over the fire, and removed therefrom at pleasure. The front of this oven occupies the whole space of the fireplace from the grate to the breast, and from jamb to jamb, its bottom resting on the flat cheeks on each side of the grate. The general form of this oven is the same with that which is usually made of sheet iron, and set into the jambs of kitchen fireplaces. Like these, also, it is made double at the bottom, sides, and back, that the heated air may freely circulate around it. The inner part is made separate, and capable of being drawn out from the outer; these parts, therefore, may be removed from, or put into, their places separately; and the objection to the weight of the whole together, thus obviated. I intend to make this oven in part of cast, and in part of sheet iron. The lower side of the outer case, for example, will be best formed of a plate of cast iron, as it is to come immediately over the coals. Its ends will rest on the cheeks of the grate; two openings, extending nearly from front to back, admit the heated air from the burning fuel into the spaces between the two cases, and an opening at top, to be regulated by sliding valves, or dampers, allows it to escape into the flue. On the cast part, such projecting rims, or flanches, are to be formed as may be necessary for the joining of the sheet iron thereto, or for other purposes. I allow the oven to be two or three inches deeper than the fireplace, making, on the front plate, a rim which projects back to this distance, to close the opening therein. I am thus enabled to give a sufficient depth to the oven, to receive dishes as large as are ordinarily required in families.

What I claim as my invention in the construction and arrangement of the within described fireplace, and its appurtenances, is, the employment of a receptacle, or air heater, such as I have described, within the flue of the chimney, whether the same be made exactly in the form and manner set forth, or in any other in which it operates upon the same principle, and produces similar effects; I do not, in this, intend to claim the mere insertion of a hollow metallic vessel within a chimney, for the purpose of heating air, and conveying it into an apartment—that having been before done, but I limit my

claim to the improved form and construction thereof, by which a much larger portion of heat is saved than by any of those formerly known. I also claim the employment of a portable oven, such as I have described, to be placed over an open fire, and to be used in the manner, and for the purposes set forth; and likewise, the general construction, arrangement, and combination of the various parts of the fireplace and the apparatus described, as contributing to the general effect intended to be produced by the particular parts.

JAMES COX.

Remarks by the Editor.—Although there is nothing new in the general principle of introducing air from without, and warming it by the waste heat from the fire, we are of opinion that there are, in the above, some points in the general arrangement of the whole, which must be productive of decided advantage. We entertained the idea that a grate placed in a sitting room, and provided with the requisite arrangements for cooking, must necessarily be unsightly; we have seen one of them set, however, and were much pleased with its appearance, and think that in those families where it is necessary to economise room, and to turn all the apartments to the best advantage, this fireplace will be productive of real benefit.

Hot Air Blast.

At a meeting of the Chemical Section of the British Association for the Advancement of Science, Dr. Clark gave an account of Mr. Nixon's process for smelting iron by aid of the hot-blast, and exhibited numerical results of the advantages derived from the new process. The saving is so great, that the total amount of coal now necessary to produce one ton of iron, amounts only to two tons and fourteen hundred-weight, whereas formerly it required eight tons and one and a half hundred-weight, being a saving of five tons and eight hundred-weight for each ton of iron produced. This subject was discussed at considerable length.

[*Ed. New Philos. Journ.*

¶ *Report on the Present State of our Knowledge respecting the Strength of Materials. By* PETER BARLOW, *Esq., F. R. S., Corr. Memb. Inst. France, &c. &c.**

[Made to the British Association for the Advancement of Science.]

The theory of the strength of materials, considered merely as a branch of mechanical or physical science, must be admitted to hold

* The volume of reports made to the British Association for the Advancement of Science, in the session of 1833, has just reached this country, and we hasten to lay before our readers the report of Mr. Barlow, on an interesting branch of practical science. This will be followed by Mr. Rennie's report on Hydraulics, considered as a branch of engineering. COM. PUB.

only a very subordinate rank; but in a country in which machinery and works of every description are carried to a great extent, it certainly becomes a subject of much practical importance; and it was no doubt viewing it in this light which led the committee of the British Association, at their last meeting, to do me the honour to request me to furnish them with a communication on the subject. In drawing my attention to this inquiry, the committee have subdivided it into the following heads: 1. Whether, from the experiments of different authors, we have arrived at any general principles? 2. What these principles are? 3. How modified in their application to different substances? And what are the differences of opinion which at present prevail on those subjects?

To these questions, without a formal division of the essay, I shall endeavour to reply in the following pages, by drawing a concise sketch of the experimental and theoretical researches which have been undertaken with reference to these inquiries.

The subject of the strength of materials, from its great practical importance, has engaged the attention of several able men, both theoretical and practical, and much useful information has been thereby obtained. As far as relates to the mechanical effects of different strains, every thing that can be desired has been effected; but the uncertain nature of materials generally will not admit of our drawing from experiment such determinate data as could be wished. Two trees of the same wood, grown in the same field, having pieces selected from the same parts, will frequently differ from each other very considerably in strength, when submitted to precisely the same strain. The like may be said of two bars of iron from the same ore, the same furnace, and from the same rollers, and even of different parts of the same bar; and so likewise of two ropes, two cables, &c. We must not, therefore, in questions of this kind, expect to arrive at data so fixed and determinate as in many other practical cases; but still, within certain limits, much important information has been obtained for the guidance of practical men; and by tabulating such results in a subsequent part of this article, I shall endeavour to answer the leading questions of the committee of the British Association, as far, at least, as relates to experimental results. In reference to theory, it must also be admitted that some uncertainty still remains; but this, likewise, is in a great measure to be referred to the nature of the materials, which is such as to offer resistances by no means consistent with any fixed and determinate laws.

Hence, some authors have assumed the fibres or crystals composing a body, to be perfectly incompressible, and others as perfectly elastic; whereas it is known that they are strictly neither one nor the other, the law of resistance being differently modified in nearly every different substance; and as it is requisite theoretically to assume some determinate law of action, it necessarily follows that some doubt must also hang over this branch of the subject. It is, however, fortunate, that whatever may be the uncertainty on these points, the relative strength of different beams or bolts of the same material, of similar forms, and submitted to similar strains, is not thereby affect-

ed; so that whatever may be the law which the fibres or particles of a body observe in their resistance to compression or extension, still, from the result of a well conducted series of experiments, the absolute resisting force of beams of similar forms, of the same materials of any dimensions, submitted to similar strains, may, as far as the mean strength can be depended upon, be satisfactorily deduced. An examination of these different views taken of the subject by different writers, will, it is hoped, be found to furnish a reply to the other queries of the committee. The first writer who endeavoured to connect this inquiry with geometry, and thereby submit it to calculations, was the venerable Galileo, in his Dialogues, published in 1633. He there considers solid bodies as being made up of numerous small fibres, placed parallel to each other, and their resistance to separation to a force applied parallel to their length, to be proportional to their transverse area—an assumption at once obvious and indisputable, abstracting from the defects and irregularities of the materials themselves. He next inquired in what manner these fibres would resist a force applied perpendicularly to their length, and here he assumed that they were wholly incompressible; that the fibres under every degree of tension resisted with the same force; and consequently, that when a beam was fixed solidly in a horizontal position, with one end in a wall, or other immovable mass, the resistance of the integrant fibres was equal to the sum of their direct resistances multiplied by the distances of the centre of gravity of their section from the lowest point, about which point, according to this hypothesis, the motion must necessarily take place.

The fallacy of these assumptions was noticed, but not corrected, by several subsequent authors. Leibnitz objected to the doctrine of the fibres resisting equally under all degrees of tension, but admitted their incompressibility, thereby still making the motion take place about the lowest point of the section; but he assumed for the law of resistance to extension, that it was always proportional to the quantity of extension. Accordingly, as the one or the other of these hypotheses was adopted, the computed transverse resistance of a beam, as depending on the absolute strength of its fibres, varied in the ratio of 3 to 2; and many fanciful conclusions have been drawn by different authors, relative to the strength of differently formed beams, founded upon the one or the other of these assumptions, which, however, it will be unnecessary to refer to more particularly in this article.

We have seen that each of these distinguished philosophers supposed the incompressibility of the fibres; but James Bernouilli rejected this part of Leibnitz's hypothesis, and considered the fibres as both compressible and extensible, and that the resistance to each force was proportional to the degree of extension or compression. Consequently, the motion, instead of taking place, as hitherto considered, about the lowest point of the section, was necessarily about a point within it; and his conclusion was, that whatever be the position of the axis of motion, or, as it is now commonly called, the neutral axis, the same force applied to the same arm of a lever, will always

produce the same effect, whether all the fibres act by extension or by compression, or whether only a part of them be extended, and a part compressed. Dr. Robinson, in an elaborate article on this subject, also assumes the compressibility and extensibility of the fibres, and, as a consequence, assumes the centre of compression as a fulcrum, about which the forces of extension are exerted, and the resistance of both forces to be directly proportional to the degree of compression or extension to which they are exposed; that is, he assumed each force, although not necessarily offering equal power of resistance, to be individually subject to the law of action appertaining to perfectly elastic bodies. In carrying on the experiments which laid the foundation of my Essay on the Strength of Timber, &c., in 1817, I was led, by several circumstances I had observed, to doubt whether, in the case of timber, this assumption of perfect elasticity was admissible. And as some of the specimens used in my experiments showed very distinctly after the fracture, the line about which the fracture took place, I thought of availing myself of this datum, and of that which gave the strength of direct cohesion, in order to deduce the law of resistance from actual experiments, instead of using any assumed law whatever.

The result of this investigation implied that the resistance was nearly as first assumed by Galileo, and although very different from what I had anticipated, yet, as an experimental result, I felt bound to abide by it, attributing the discrepance to the imperfectly elastic properties of the material. Mr. Hodgkinson, however, in a very ingenious paper, read at the Manchester Philosophical Society in 1822, has pointed out an error in my investigation, by my having assumed the momentum of the forces on each side the neutral axis as equal to each other, instead of the forces themselves; consequently, the above deduction in favour of the Galilean hypothesis fails. This paper did not come to my knowledge till the third edition of my essay was nearly printed off, and the correction could not then be made; but being made, it proves that the law of actual resistance approaches much nearer to that of perfect elasticity, than from the nature of the materials there could be any reason to expect; so that, in cases where the position of the neutral axis is known, and also its resistance to direct cohesion, a tolerably close approximation may be made to the transverse strength of a beam of any form, by assuming the resistance to extension to be proportional to the quantity of extension, and the centre of compression as the fulcrum about which that resistance is exerted. But I have before observed, and beg again to repeat, that by far the most satisfactory data will always be obtained by experiments on beams of the like form, (however small the scale,) and of the same material as those to be employed, because then the law of resistance forms no part of the inquiry, and does not necessarily enter into the calculation, the ultimate strengths being dependent on the dimensions only, whatever may be the absolute or relative resistance of the fibres to the two forces we have been considering.

At present, I have only considered the resistance of a beam to a transverse strain; but there is another mode of application, in which,

again, the law of resistance necessarily enters, and has led to many curious and mysterious conclusions. This is when a force of compression is applied parallel to the length. In the case of short blocks, the resistance of the material to a crushing force is all that is necessary to be known; and in the Philosophical Transactions for 1818, we have a highly valuable table of experimental results on a great variety of materials, by George Rennie, Esq., which contains nearly all the information on this subject that can be desired. But when a beam is of considerable length in comparison with its section, it is no longer the crushing force that is to be considered; the beam will bend and be ultimately destroyed by an operation very similar to that which breaks it transversely; and the investigation of these circumstances has called forth the efforts of Euler, Lagrange, and some other distinguished mathematicians.

When a cylinder body, considered as an aggregate of parallel fibres, is pressed vertically in the direction of its length, it is difficult to fix on data to determine the point of flexure, since no reason can be assigned why it should bend in one way rather than in another; still, however, we know that, practically, such bending will take place. And it is made to appear, by the investigations of Euler and Lagrange, that with a certain weight this ought, theoretically, to be the case; but that with a less weight, no such effect is produced—an apparent interruption of the law of continuity not easily explained, which exhibits itself, however, analytically, by the expression for the ordinate of greatest inflection being imaginary, till the weight or pressure amounts to a certain quantity. Another mysterious result from these investigations is, that while the column has any definite dimensions, and is loaded with a certain weight, inflection, as above stated, takes place; but if the column be supposed infinitely thin, then it will not bend till the weight is infinitely great. These investigations of two such distinguished geometers, are highly interesting as analytical processes; but the hypothesis on which they are founded, namely, that of the perfect elasticity of the materials, is inconsistent with the nature of bodies employed in practice; they form, therefore, rather an exercise of analytical skill, than of useful practical deductions. There is, however, one useful result to be drawn from these processes, which is, that the weight under which a given column begins to bend, is directly as its absolute elasticity; so that, having determined experimentally the weight which a column of given elasticity will support safely, or that at which inflection would commence, we may determine the weight which another column of the same dimensions, but of different elasticity, may be charged with without danger.

M. Gerard, a member of the Institute of France, aware of the little practical information to be derived from investigations wholly hypothetical, has given the detail of a great number of actual experimental results connected with this subject, on oak and fir beams of considerable dimensions, carried on at the expense of the French government —from which he has drawn the following empirical formulæ, viz:

1. In oak beams, $\frac{Pf^2}{3b} = \frac{11784451\,(f + .08)\,ah^2}{1.3}$

2. In fir beams, $\frac{Pf^2}{3b} = 8161128\,ah^2$

where P = half the weight in kilogrammes, a the less, and h the greater sides of the section; f half the length of the column, and b the versed sine of inflection, the dimensions being all metres.

How far these formulæ are to be trusted in practical construction, is, however, I consider, rather doubtful, because they are drawn from a number of results which differ very greatly from each other; and in one case in particular, the result, as referred to the deflection of beams, has been satisfactorily shown to be erroneous by Baron Charles Dupin, in vol. x. of the Journal de l'Ecole Polytechnique, as also by a carefully conducted series of experiments in my Essay on the Strength of Timber, &c. I conceive it, therefore, to be very desirable that a set of experiments on this application of a straining force on vertical columns, should be undertaken; and it is, perhaps, the only branch of the inquiry connected with the strength of materials, in which there is a marked deficiency of practical data; at the same time, it is one in which both timber and iron are being constantly employed. We see every day in the metropolis, houses of immense height and weight being built, the whole fronts of which, from the first floors, are supported entirely by iron or wooden columns; and all this is done without any practical rule that can be depended upon for determining whether or not these columns are equal to the duty they have to perform.

I say this with a full knowledge that Mr. Tredgold has furnished an approximate rule for this purpose; but the principle on which it is founded, has no substantial basis. The extraordinary skill which Mr. Tredgold possessed in every branch of this subject, and the great ingenuity he has displayed in investigating and simplifying every calculation connected with architectural and mechanical construction, certainly entitle his opinion to high consideration; but still, on a subject of such high importance, it would be much more satisfactory to be possessed of actual experimental data. The supposition he advanced was made entirely as a matter of necessity, and I am confident that no one would have been more happy than himself to have been enabled to substitute fact for hypothesis, had he possessed the means of adopting the former. But unfortunately such a series of experiments is too expensive and laborious to be undertaken by an individual situated as he was, having a family to maintain by his industry, and whose close and unremitting application to these and similar inquiries, in all probability shortened his valuable life.*

* Mr. Tredgold's Principles of Carpentry, and his Treatise on the Strength of Iron, ought to be in the possession of every practical builder; besides which two works, he published many separate articles on the same subject, in different numbers of the Philosophical Magazine.

At present, I have referred principally to experiments made with a view of determining the ultimate strength of materials; and with data thus obtained, practical men have been enabled to pursue their operations with safety, by keeping sufficiently within the limits of the ultimate strain the materials would bear, or rather with which they would just break, some working to a third, others to a fourth, &c., of the ultimate strength, according to the nature of the construction, or the opinion of the constructor. But it is to be observed, that although we may thus ensure perfect safety, as far as relates to absolute strength, there are many cases in which a certain degree of deflection would be very injurious. It is therefore highly necessary to attend also to this subject, particularly as the deflection of beams, and their ultimate strength, depend upon different principles, or are at least subject to different laws. Hence, most writers of late date give two series of values, one exhibiting the absolute or relative strength, and the other the absolute or relative elasticities. These values will, of course, be found to differ in different authors, on account of the uncertainty in the strength of the materials already referred to; but amongst recent experiments, the difference is not important; they will also be found differently expressed, in consequence of some authors deducing these numbers from experiments differently made. Some, for example, have drawn their formulæ for absolute strength, from experiments made on beams fixed at one end, and loaded at the other, using the whole length; some, again, from experiments on beams supported at each end, and loaded in the middle, using the half length. Some take the length in feet, and the section in inches; others, all the dimensions in inches; and a similar variety occurs in estimating the elasticity. Also, in the latter case, some authors employ what is denominated the modulus of elasticity, in which latter case the weight of the beam itself, and consequently its specific gravity, enters. These varieties of expression, however, are not to be understood as arising from any difference of opinion amongst the authors from whom they proceed, but merely as different modes of expressing the same principles; indeed, in reply to that inquiry of the committee in reference to this point, I may, I think, venture to say, there is not at present any difference of opinion on any of the leading principles connected with the strength of materials, with the exception of such as are dependent entirely upon the imperfect nature of the materials themselves, and which, as we have seen, will give rise to different results in the hands of the same experimenter, and under circumstances in every respect similar.

As I distinguish the doctrine of the absolute resistance, or strength of materials, which is founded on experiment, from that which relates to the amount and resolution of the forces or strains to which they are exposed, which is geometrical; and as I confine myself to the former subject only in this essay, it is not, I conceive, necessary to extend the preceding remarks to any greater length. I shall therefore conclude by giving a table of the absolute and relative values of the ultimate strength and elasticity of various species of timber and

other materials, selected from those results in which I conceive the greatest reliance may be placed.

Formulæ relating to the ultimate Strength of Materials in cases of Transverse Strain.—Let $l\ b\ d$ denote the length, breadth, and depth, in inches, in any beam; w, the experimental breaking weight, in pounds; then will $\frac{l\,w}{b\,d^2} = S$, be a constant quantity for the same material, and for the same manner of applying the straining force; but this constant is different in different modes of application. Or, making S constant in all cases for the same material, the above expression must be prefixed by a coefficient, according to the mode of fixing and straining.

1. When the beam is fixed at one end, and loaded at the other,

$$\frac{l\,w}{b\,d^2} = S.$$

2. When fixed the same, but uniformly loaded,

$$\tfrac{1}{2} \times \frac{l\,w}{b\,d^2} = S.$$

3. When supported at both ends, and loaded in the middle,

$$\tfrac{1}{4} \times \frac{l\,w}{b\,d^2} = S.$$

4. Supported the same, and uniformly loaded,

$$\tfrac{1}{8} \times \frac{l\,w}{b\,d^2} = S.$$

5. Fixed at both ends, and loaded in the middle,

$$\tfrac{1}{6} \times \frac{l\,w}{b\,d^2} = S.$$

6. Fixed the same, but uniformly loaded,

$$\tfrac{1}{12} \times \frac{l\,w}{b\,d^2} = S.$$

7. Supported at the ends, and loaded at a point not in the middle. Then, $n\ m$, being the division of the beam at the point of application,

$$\frac{n\,m}{l^2} \times \frac{l\,w}{b\,d^2} = S.$$

Some authors state the coefficients for cases 5 and 6 as $\frac{1}{8}$ and $\frac{1}{16}$; but both theory and practice have shown these numbers to be erroneous.

By means of these formulæ, and the value of S, given in the following table, the strength of any given beam, or the beam requisite to bear a given load, may be computed. This column, however, it must be remembered, gives the ultimate strength, and not more than one-third of this ought to be depended upon for any permanent construction.

Formulæ relating to the Deflection of Beams in cases of Transverse Strains.—Retaining the same notation, but representing the constant by E, and the deflection in inches by S, we shall have,

Case 1. $\frac{32}{1} \times \frac{l^3 w}{b\, d^3\, \delta} = E.$	Case 4. $\frac{5}{8} \times \frac{l^3 w}{b\, d^3\, \delta} = E.$
2. $\frac{12}{1} \times \frac{l^3 w}{b\, d^3\, \delta} = E.$	5. $\frac{2}{3} \times \frac{l^3 w}{b\, d^3\, \delta} = E.$
3. $\frac{1}{1} \times \frac{l^3 w}{b\, d^3\, \delta} = E.$	6. $\frac{5}{12} \times \frac{l^3 w}{b\, d^3\, \delta} = E.$

Hence again, from the column marked E in the following table, the deflection a given load will produce in any case, may be computed; or, the deflection being fixed, the dimensions of the beam may be found. Some authors, instead of this measure of elasticity, deduce immediately from the formula $\frac{l^3 w}{3\, b\, d^2\, \delta} = E$, substituting for w, the height in inches of a column of the material, having the section of the beam for its base, which is equal to the weight w, and this is then denominated the modulus of elasticity. It is useful in showing the relation between the weight and elasticity of different materials, and is accordingly introduced into the following table.

The above formulæ embrace all those cases most commonly employed in practice. There are, of course, other strains connected with this inquiry, as in the case of torsion in the axles and shafts of wheels, mills, &c., the tension of bars in suspension bridges, and those arising from internal pressure in cylinders, as in guns, water-pipes, hydraulic presses, &c.; but these fall rather under the head of the resolution of forces, than that of direct strength. It may just be observed, that the equation due to the latter strain is

$$t\,(c-n) = n\,R.$$

Where t is the thickness of metal in inches, c the cohesive power in pounds of a square inch rod of the given material, n the pressure on a square inch of the fluid in pounds, and R the interior radius of the cylinder in inches. Our column marked C will apply to this case, but here again not more than one-third the tabular value can be depended upon in practice.

Table of the Mean Strength and Elasticity of various Materials, as deduced from the most accurate Experiments.

Names of Materials.	Specific Gravity.	C Mean Strength of cohesion on an inch section.	$S = \frac{l\,w}{4\,b\,d^2}$ Constants for transverse strains.	$E = \frac{l^3\,w}{b\,d^3\,\delta}$ Constants for deflections.	Modulus of Elasticity	Remarks.
Woods.		*lbs.*				*Growth.*
Acacia	710		1800	4609000	3739000	English.
Ash	760	17000	2026	6580000	4988000	ditto.
Beech	700	11500	1560	5417000	4457000	ditto.
Birch, common	700		1900	6570000	5406000	ditto.
—— Amer. black	750		1500	5700000	3388000	American.
Box	1000	20000				
Bullet tree	1030		2650	10512000	5878000	Berbice.
Cabacully	900		2500	7437000	4759000	ditto.
Deal, Christiana	680	11000	1550	6350000	5378000	
—— Memel	590	11000	1730	6420000	6268000	
Elm	540	5780	1030	2803000	3007000	English.
Fir, New England	550	12000	1100	5967000	6249000	
—— Riga	750	12600	1130	5314000	4080000	
—— Mar Forest	700	12000	1140	3400000	2797000	Scotland.
Green heart	1000		2700	10620000	6118000	Berbice.
Larch, Scotch	540	7000	1120	4200000	4480000	
Locust tree	950	20580	3400	767000	4649000	S. America
Mahogany	637	8000				
Norway Spars	580	12000	1470	5830000	5789000	
Oak, English from	700	9000	1200	3490000	2872000	Results
Oak, English to	900	15000	2260	7000000	47020000	variable
—— African	980	14400	2000	9500000	55830000	
—— Adriatic	990	14000	1380	3880000	2257000	
—— Canadian	872	12000	1760	8590000	5674000	
—— Dantzic	760	14500	1450	4760000	3607000	
Pear tree	646	9800				
Poon	600	14000	2200	6760000	6488000	E. Indies.
Pine, Pitch	660	10500	1630	5000000	4364000	
—— Red	660	10000	1340	7360000	6423000	
Teak	750	15000	2460	9660000	7417000	E. Indies.
Tonquin Bean	1050		2700	10620000	5826000	Berbice.
Iron.						
Iron, cast from / to	7200	16300 / 36000	8100	69120000	5530000	Mean of English
—— Malleable,	7760	60000	9000	91440000	6770000	and
—— Wire,		80000				Foreign

French Aerial Ship.

We extract the following notice from the Morning Chronicle of the 14th inst.

An Aerial Ship.—There is now exhibiting on the premises of the Aeronautical Society, Paris, in the Champs Elysees, what might not

unaptly be termed a monster balloon. This novel conveyance consists of a balloon of 134 feet long, 34 feet high, and about 25 feet wide. It is in the form of the air-bladder of a fish, rather wide in the middle, whilst the ends are in the form of pointed cones. A balloon in this shape will meet with six times less resistance than one in a round form; and that which we are now describing is calculated to raise a weight of 6,500 lbs. The car, which is made of wicker-work, painted tri-colour, is sixty-six feet long, and very narrow, with seats, (also made of wicker work,) across it at regular distances; thirty persons could be accommodated in the car, which is fixed *immediately under* the balloon, contrariwise to the plan hitherto followed, which was to suspend the car at some distance below the balloon, to the movements of which it was entirely subservient, without the possibility of giving it any impulse. The material of which the balloon is made, is prepared in such a way as to preserve the gas for fifteen days. There is a rudder at each end of the car; and at each side thereof there are two wheels, to which are attached paddles made of prepared canvass, in light iron frames; these paddles are so contrived as occasionally to present a flat surface to the air, and occasionally a cutting edge, and they are set in rotary motion by means of a handle. The following is the manner in which the new aeronauts intend to cause their balloon to ascend or descend, without throwing out ballast, or expending the gas. In 1787, Baron Scott and M. Meunier, of the Academy of Sciences, observed that the air-bladder in the interior of the body of fishes, possessed the property of permitting them to plunge to the bottom, or rise to the surface of the water, according to whether the said bladder was compressed or dilated. In imitation of this phenomenon, a small balloon is introduced, under the principal one, whereby, according to the quantity of exterior air which is introduced therein, a difference of thirty pounds weight of air, more or less, will be made in the weight opposed to the large balloon. This will place at the disposal of the aeronauts, a powerful means of elevating their aerial ship at will, to the current of air they may find necessary for their purposes. They also have so arranged their paddles, as to enable them to imitate the movements of birds, which do not fly in a direct line, against the wind, but tack, as it were, in the air, by rising and descending in inclined directions. According to this system, the aerial ship will tack, by inclined movements, alternately up and down, as marine ships tack horizontally from right to left, &c. Besides the means of giving the desired direction to their balloon, it would appear that the aeronauts have another method, of which they preserve the secret; but from what transpired in conversation, we imagine it may consist of a sort of bellows of their own invention, whereby currents of air may be created, of sufficient rapidity to form *points d'appui* for each paddle and each rudder. The means of directing this aerial ship, then, are, in a few words, as follows:—The aeronauts would seek for a current of air favourable to convey them in the wished-for direction. If they should succeed in this, they might travel at an average rate of ten or twelve leagues an hour, and often from thirty-five to

forty leagues an hour. If they should find themselves between two winds in different directions, they would advance at the rate of from two to five leagues an hour, or they would remain stationary (lay to) waiting for a favourable wind; in the third place, if they should encounter a foul wind, they would tack, by describing curved lines up and down, like birds that fly against the wind. The aeronauts will of course be provided with a compass, thermometer, &c.; they have also invented an apparatus to serve the purpose of a ship's log-line, which will ascertain the vertical and horizontal velocity of the balloon. They will likewise take with them one of Sir Humphrey Davy's safety lamps, and a phosphoric lantern, which, without running the risk of setting fire to the balloon, will shed a sufficient light to enable the party to read, write, and see the compass, if overtaken by night. The principal projector of this gigantic undertaking is M. Lennox, formerly a superior officer in the French army, and who acted a conspicuous part in politics, during the first two years after the revolution of July. He was to ascend in the balloon on the 15th of August (Friday last) from the Champ de Mars, accompanied by seventeen persons, among whom will be Madame Lennox and another lady. The adventurous party seem very sanguine as to their success, and say they could reach London in six or eight hours, with a fair wind. A number of experiments have been made within the last two years, and all appears to be systematically arranged.

(*From the Globe of Wednesday last.*)

The ship was to have ascended on the 15th instant, from the Champ de Mars, at Paris. Various circumstances caused the experiment to be delayed until the 17th. At about nine in the morning, the gigantic balloon was removed from the place where it had been exhibited, to the Champ de Mars; and from that hour the whole population was in movement. Near to the spot where the balloon-ship was prepared, an experiment had lately been made of a rail-road, or *chemin de fer*; but this did not excite the curiosity of the gay Parisians by any means to an equal degree as did the hardy attempt of the eighteen navigators who were about to go on a voyage for the discovery of a *chemin dans les airs!* Thus the inhabitants proceeded *en masse* to that same Champ de Mars, where so many waxen wings have been melted—so many airy projects exploded!

As noon approached, the reserved seats began to fill, and hundreds of horsemen, private equipages, carts, in short, every possible description of vehicle, flanked by countless thousands of pedestrians, were seen converging from every quarter of the city towards the point of attraction, amidst clouds of dust, and under a sun worthy the meridian of Madras. As the immense masses of curious individuals, however, approached the scene of action, various indications that something had gone wrong presented themselves, in the shape of returning provision carts, freighted with uneaten cargoes, itinerant piemen, with long faces, &c.; and it was speedily ascertained that at about half-past twelve, the balloon, which had been completely inflated, and was floating at a certain height, to which it was confined

by cords, and at the moment when it was being drawn down, in order that the aeronauts might embark in the car, suddenly turned topsy-turvy, and burst with a loud explosion! [*Lond. Mech. Mag.*

India Rubber Carpets.

Having some India rubber varnish left, which was prepared for another purpose, the thought occurred to me of trying it as a covering to a carpet, after the following manner: A piece of canvass was stretched and covered with a thin coat of glue, (corn meal size will probably answer best;) over this was laid a sheet of brown paper, or newspaper, and another coat of glue added, over which was laid a pattern of house papering, with rich figures. After the body of the carpet was thus prepared, a very thin touch of glue was carried over the face of the papers, to prevent the India rubber from tarnishing the beautiful colours of the paper. After this was dried, one or two coats (as may be desired) of India rubber varnish were applied, which, when dried, formed a surface as bright as polished glass, through which the variegated colours of the paper appeared with undiminished, if not with increased, lustre. This carpet is quite durable, and is impenetrable to water, or grease of any description. When soiled, it may be washed like a piece of smooth marble, or wood. If gold or silver form the last coat, instead of papering, and the varnish is then applied, nothing can exceed the splendid richness of the carpet, which gives the floor the appearance of being burnished with gold or silver. A neat carpet on this plan will cost, when made of good papering, about 37 cents a yard. When covered with gold or silver leaf, the cost will be about 100 or 150 cents a yard.

[*Lond. Mech. Mag.*

CELESTIAL PHENOMENA, FOR JANUARY, 1835.
Calculated by S. C. Walker.

Day.	H'r.	Min.					
12	6	53	Im.	5 Gem.	,7,	N158°	V118°
12	7	37	Em.			230°	196°
13	4	46	Em.	ω' Gem.	,6,	277°	226°
13	9	28	N. App. ☽ and 48 m Gem.		,6,	☽ N. 3',2	
18	7	19	Im.	3 ν Virg.	,4,5,	114°	72°
18	7	56	Em.			208°	162°
21	14	52	Im.	127 Libræ,	,6,7,	93°	52°
21	15	49	Em.			203°	172°
22	13	34	Im.	(1060)·Libræ,	,7,	61°	12°
22	14	36	Em.			267°	216°
23	15	55	Im.	ω' Ophinchi,	,5,	120°	77°
23	16	49	Em.			220°	182°

Notice of Jacquard.

Jacquard, the inventor of the silk weaving machine which bears his name, died recently at Paris. For the last century Lyons produced but plain silks, a kind in which Switzerland and England can successfully compete with, and undersell the French. But Jacquard's invention enabled Lyons to preserve the superiority in figured silks. "If Lyons," says a French journal, "has 32,000 looms, and if each loom does a third more than it did forty years ago—if Lyons preserves its superiority, and extends its trade, despite of Zurich and its new silk fabrics, despite of Crevelt—of Elberfeld—of Austria's doubling its silk manufactures—despite of Saxony and Russia, and of the 40,000 looms of England, she owes all this to Jacquard." Jacquard, notwithstanding, died poor, at the advanced age of eighty-two years. [*Mech. Mag.*

Meteorological Observations for October, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	52°	68°	30.10	29.80	S.	Moderate.	0.33	Cloudy—rain.
⊗	2	70	75	29.70	.70	SW.	Brisk.		Cloudy—flying clouds.
	3	54	68	.90	.95	WNW.	do.		Clear day.
	4	58	70	.80	.70	SE.	Moderate.	0.35	Cloudy—drizzle—rain.
	5	48	56	.85	.90	NW.	Brisk.		Clear day.
	6	46	60	30.20	30.25	W.	Moderate.		Clear day.
	7	42	66	.25	.25	W.	do.		Clear—lightly cloudy.
	8	56	64	.10	.05	S.	do.	0.03	Cloudy—drizzle.
☾	9	59	75	29.70	29.64	SW.	Brisk.		Cloudy—lightly cloudy.
	10	49	53	.73	30.00	NW.	do.		Clear day.
	11	36	54	30.30	.35	SE.	Moderate.		Clear—frost—clear.
	12	39	63	.20	.13	SW.	do.		Clear—hazy.
	13	54	62	29.90	29.80	SW.	do.	0.08	Cloudy—rain.
	14	38	44	.75	.80	NW.	do.		Clear day.
	15	30	44	30.10	30.15	NW.	do.		Clear day.
	16	29	54	.25	.30	NW. S.	do.		Clear—hazy.
☉	17	49	65	.30	.15	SW.	Breeze.		Cloudy—hazy.
	18	51	71	29.95	29.85	SW.	Brisk.		Clear—hazy.
	19	43	37	.65	.65	NW.	do.	0.70	Rain.
	20	24	47	.74	.80	NW.	Moderate.		Clear day.
	21	33	54	30.10	30.20	NW.	do.		Clear day.
	22	33	52	.05	29.90	SW.	do.		Clear—lightly cloudy.
	23	44	52	29.90	.90	W.	Brisk.		Clear—hazy.
	24	31	52	30.15	30.15	W.	Moderate.		Clear—hazy.
☽	25	34	52	.25	.30	W.	do.		Clear day.
	26	44	56	29.90	29.60	S.	do.	1.25	Rain.
	27	34	52	.85	.85	NW.	do.		Clear day.
	28	33	46	.85	.90	W.	do.		Clear day.
	29	33	43	30.10	30.20	W.	do.		Clear day.
	30	30	40	.35	.35	W.	do.		Cloudy day.
	31	36	46	.70	.70	NE.	do.		Cloudy day.
	Mean	42.39	56.16	30.02	30.01			2.74	

	Thermometer.	Barometer.
Maximum height during the month,	75. on 2nd and 9th,	30.70 on 31st.
Minimum do.	24. on 20th.	29.60 on 26th.
Mean do.	49.27	31.01

INDEX.

AMERICAN PATENTS, LIST OF, WITH EDITOR'S REMARKS, &c.